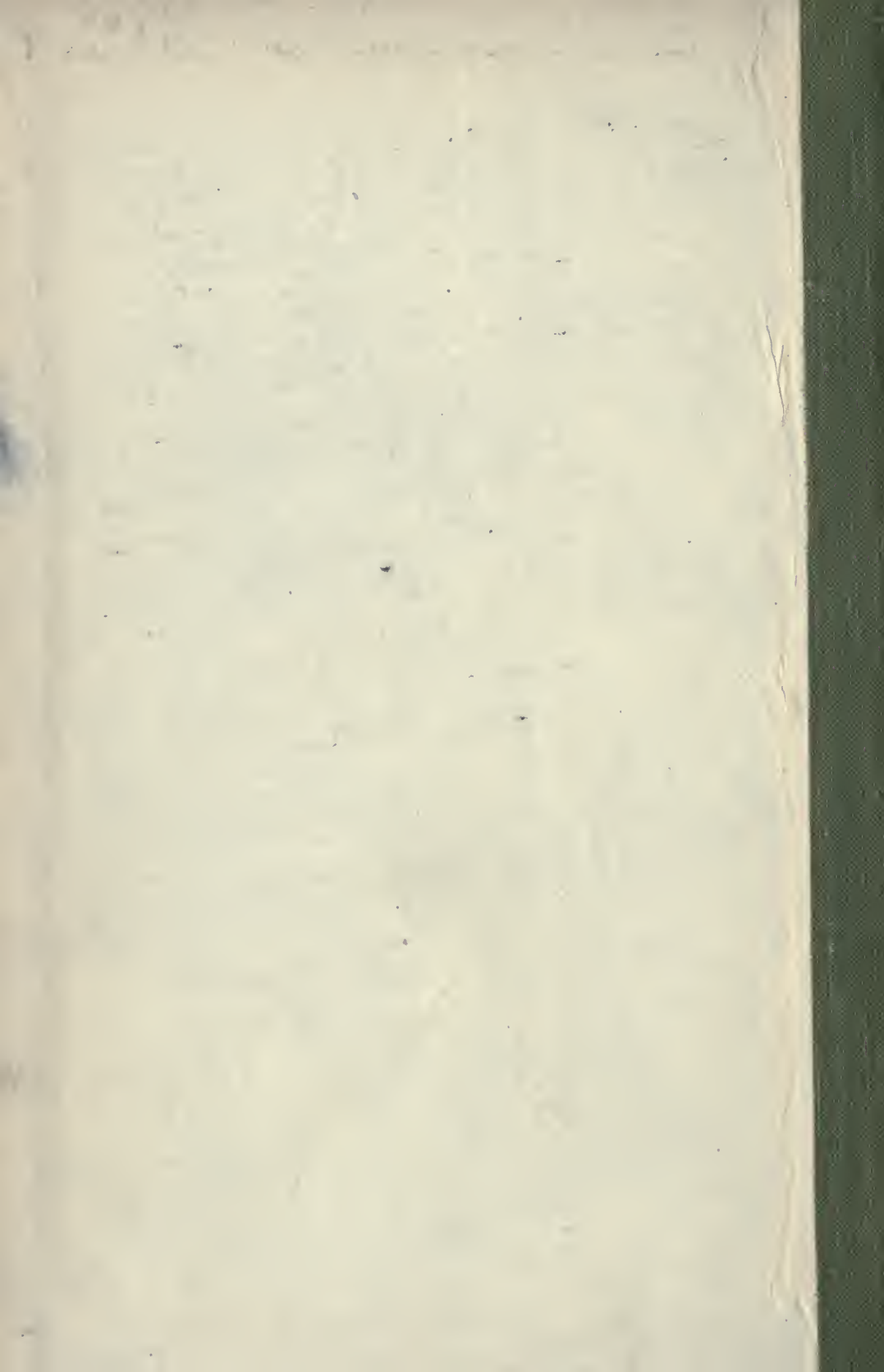


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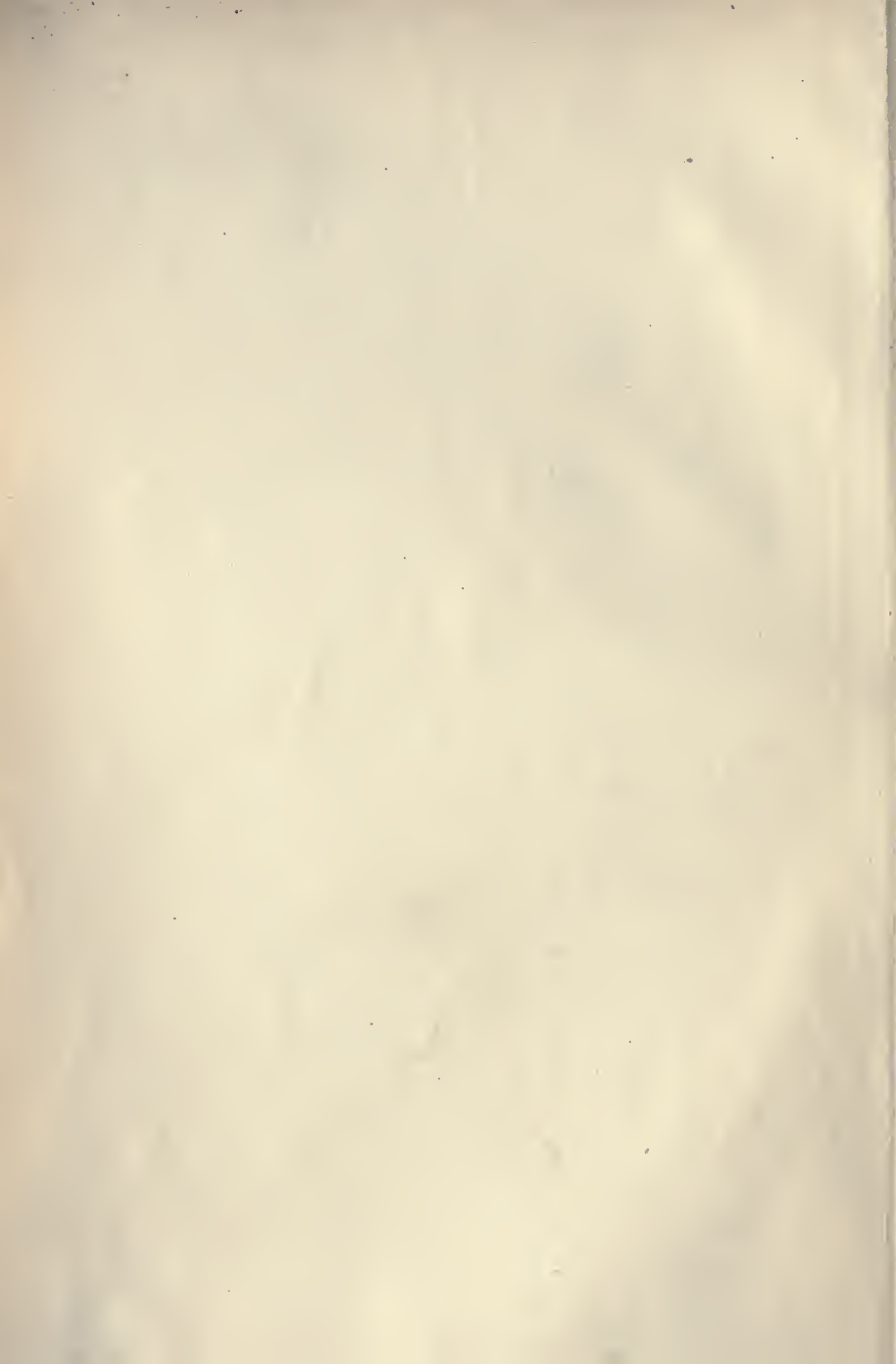




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*W. P. Watson*

I

# ARCHIVES OF PEDIATRICS

A MONTHLY JOURNAL DEVOTED TO THE  
DISEASES OF INFANTS AND CHILDREN

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VOLUME XXXIV.

JANUARY TO DECEMBER

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NEW YORK

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# ARCHIVES OF PEDIATRICS

JANUARY, 1917

ROYAL STORRS HAYNES, PH.B., M.D. }  
HAROLD RUCKMAN MIXSELL, A.B., M.D. } Editors

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PUBLISHED MONTHLY BY E. B. TREAT & CO., 241-243 WEST 23D STREET, NEW YORK

## ORIGINAL COMMUNICATIONS

### HISTORY OF PEDIATRICS IN NEW YORK\*

BY ABRAHAM JACOBI, M.D.

New York

In October, 1901, I read before the New York Academy of Medicine the Wesley Carpenter lecture on "The History of American Pediatrics before 1800." New York had very little to boast of except disease; of observations and knowledge, it had none of consequence. But we New Yorkers have a great deal of self-sufficiency. We think much of ourselves, even of our ailments, for we are Americans and always ready to believe we are independent when we are imitators. Our big epidemic of measles reached us in 1778 by way of Salem and all New England. Bad attacks followed 1778—1790, 1795, 1796—and spread like influenza all over the United States. Variola

\* Read at the New York Academy of Medicine, Section on Pediatrics, December 14, 1916.

and other diseases followed. Noah Webster (1799) was convinced that catarrh, measles, mild variola and whooping-cough are but varieties of the same disease, occasioned by modifications of the same elementary causes. These causes are droughts, frost, earthquakes, volcanic eruptions, meteors, comets; also destructive invasions of caterpillars. The popular opinion that measles and smallpox never originate in the human constitution without contagion is, according to Webster, a "palpable absurdity." He says (Vol. II., p. 60): "The first cases of these diseases in every epidemic period are always generated in the human body without contagion." That was the epidemiology of the end of the eighteenth century. But we may claim the excuse that Noah Webster was no medical man. Still, our great authority, Aulus Cornelius Celsus was no doctor, either.

Scarlatina, which Noah Webster does not believe to be contagious (he calls it "infectious") was mild in 1789 and 1791, but was very malignant in 1793 and complicated with angina.

Diphtheria was called "throat distemper" through the country until 1736, when it was first observed in Kingston, N. H. The epidemic gradually broke out in Connecticut, New York and New Jersey. Wickes (History of Medicine in New Jersey) quotes two notices regarding this outbreak from Zenger's Weekly. "Take some honey and the strongest vinegar, with alum dissolved therein, and let the patients often gargle it in their throats; or, if they be children, then take a feather and dip it in said liquor and so wash their throats."

Samuel Bard wrote a brilliant little book, "An Inquiry into the Nature, Cause and Cure of the Angina Suffocativa, or Throat Distemper, as it is Commonly Called by the Inhabitants of this City and Colony, by Samuel Bard, M.D., and Professor of Medicine in King's College, New York. Is recte curaturus quem prima origo causæ non pefellerit.—Celsus. New York, by S. Inslee and A. Tar, at the New Printing Office in Beaver Street, 1771."

Bard's book is wise and accurate. His style classical and simple, and the description of diphtheria in skin, mucous membrane and larynx is correct and beautiful. He knew the different forms of the disease even better than Dr. Douglass, of Boston, had distinguished them. My old friend, Dr. John C. Peters, of New York, criticised him, August 1876, in West Virginia Medical Studies. The breath of infected persons was the main source

of contagion. That is why a neighboring house was not infected. The influence which Bard might have exerted in shaping the professional opinion of the nature of the disease did not make itself properly felt; he was too modest and too distant from Europe. "A Letter from Peter Middleton, M.D., to Mr. Richard Bailey on the Croup," dated New York, November 20, 1780, had become almost forgotten and was reprinted in *Medical Repository*, I. Third Vol. II., New York, 1811, p. 347. It contains all Middleton's knowledge of the disease. He had emigrated from Scotland in 1752, and agreed with Home's views on croup. He says he met with *local* membranous croup only, though he does "not presume to say that it is never complicated with the malignant sore throat." He reports cases and autopsies observed since 1752. His treatment consisted of jugular venesections, blisters over the throat and evacuants.

Dr. Richard Bailey wrote to Dr. William Hunter, of London, in 1781. His letter was in part reproduced in the *Medical Repository* of 1809 and 1811. He describes the throat distemper complicated with pharyngeal diphtheria, contrary to Middleton, who separated the two. He also has seen suffocation, the "Angina trachealis." It is to him "an inflammatory disease;" the treatment differs according to symptoms and violence. Some cases require common antiphlogistic treatment; bad cases demand jugular venesection and tartar emetic and other evacuants, with a large blister; the mucus filling up the bronchi requires the action of vomiting.

Horace Green, in 1840, published cases of laryngeal and bronchial diseases which he claimed to have cured by intratracheal applications. In 1846 he published a book, "A Treatise on the Diseases of the Air Passages, etc.," with the same statements. He was savagely attacked by many of his colleagues in New York. Probably these attacks tempted him to exaggerate his claims; one of the Societies made him resign; the New York Academy of Medicine treated, and in part maltreated, him, but he was not expelled. Many of his peers supported him; others did not. That he ever succeeded in treating locally the bronchial tubes beyond the larynx is doubtful, but I have attended a number of his demonstrations personally, and succeeded myself in introducing sounds as far down as to the larynx, and never doubted his successes. I never thought, however, that he did himself justice, through making the mistake of rendering his nitrate of silver



solutions too strong. I told him so, but his sensitiveness prevented me from repeating my offence. When I lectured on diseases of the infant larynx in the summer course of the P. & S., between 1857 and 1860, he found fault with me for not insisting on the nature of his teaching in public. Meanwhile I came near succeeding—or rather missing—doing something better.

In 1856 I had a patient who suffered badly from syphilidophobia. He insisted upon having ulcers of his larynx, the existence of which I denied. He called upon me almost daily, until I had a mirror made through which I learned to inspect the larynx. At last I succeeded, and told him that I could see all the inner surface of the larynx, which was normal. Then he believed, and I was satisfied, but, unfortunately, too much so. I put my mirror aside, never to try it again. Within a year, however, Garcia invented his laryngoscope, and I learned too late that I had missed my opportunity to make a great discovery and win fame.

The man who has done the most for laryngology in America—children and adults—was Dr. Louis Elsberg, of New York, the first president, in 1879, of the American Laryngological Association. The most erudite author on the larynx and kindred subjects is Jonathan Wright, of this Academy, in his second edition of "*A History of Laryngology and Rhinology*," 1914.

Dr. James Stewart's text book on diseases of children was published in New York in 1843. In it, pathological anatomy and Laennec's innovation—namely, auscultation and percussion—found their legitimate place. He taught the specificity of the origin of infectious epidemic diseases for the first time in America. I called on him to pay my respects and thanks. That was not customary in America. He snubbed me.

B. Beck, in 1848, published a small book, "*Essay on Infant Therapeutics*," which is full of practical knowledge and common sense. His remarks on opium, which was used a great deal by doctors and still more by laymen, are fine. Emetics, mercury, vesicatories and depletion are treated with a good deal of knowledge and emphasis. It should be remembered that the great panacea in children's practice was calomel, and always calomel. The boast that some Southerners make of their relying solely on calomel and quinin is not confined to that part of the country. We in New York also tend to use it where there is no indication.

Dr. Watson was one of the most learned and popular physicians in New York. His practice was mostly surgical; so was his teaching. He published a good book on "Ancient Medicine." In the *New York Medical Times*, September 20, 1853, he spoke in favor of establishing a specialty for the surgical diseases of children. He did not know the influence his word might have, or it may be he would have thought twice before speaking. But it is true that pediatry was not deemed worth considering. It never was taught in a medical school.

The history of pediatry—pedology—in America cannot be written without the name of Dr. J. Lewis Smith being mentioned in a prominent place. He was the brother of Dr. Stephen Smith, who, as a surgical writer and teacher, a statistical author and philanthropic citizen, is still living and active among us, though almost a centenarian. The work of J. Lewis Smith among the sick of New York—mainly the poor—was unprecedented. His observations were almost always correct, and he began to write at an early time. "Eleven Autopsies of Cholera Infantum Cases" was published by him in 1858. His principal work was his text book, which from 1869 to 1896 was published in eight editions. He wrote a good deal on children, several essays for Pepper's system of medicine, often on diphtheria and croup—valuable contributions suffered from the fact that Eberth, Loeffler and Behring had not then existed. He was a self-sacrificing doctor and teacher. In 1861 he joined the new Bellevue Hospital College as a clinical Professor of the diseases of children, and later died in harness. For many years he attended the Infant Hospital of Randall's Island, which was governed by the Commissioners of Charities, and also the Ward Island idiots.

I stop here to pay honor to the memory of Dr. Joseph O'Dwyer. He was a private practitioner in New York, and a great benefactor of yours and the public at large. His intubation was conclusively described by him when in 1896 he gave his inaugural presidential address before the American Pediatric Society. Before he succeeded in saving by intubation a four-year-old girl on May 21, 1884, he had worked for years on the anatomy and technical difficulties of the larynx. His difficulties were enormous, for he was ignorant of Bouchut's long exertions and mostly unsuccessful labors in Paris. Indeed, when I told him Bouchut's painful history he burst into tears. It was only in 1887 that he was recognized as deserving the ap-

preciation which finally came to him. The State Society of New York gave him his first splendid opportunity, and the New York Academy of Medicine opened its doors and offered its platform to him in 1887, while I was its presiding officer, for a large and influential meeting which gave him an audience and world-wide manifestations of appreciation and gratitude. Hutinel in Paris, Bokay in Buda Pesth, Concetti in Rome, Rauchfuss in Petrograd, were his principal followers among foreigners.

Part of the surgical pedology is the history of tracheotomy. The men who practiced it mostly were Waldemar von Roth of Russia, Lothar Voss of Germany, and Ernst Krackowizer of Austria—better call him Ernst Krackowizer of New York, for this city never had a more universal physician nor better citizen. He taught me. These men were all surgeons, but tracheotomy was more frequently performed by me in connection with pediatric practice than by any of the rest of the American doctors. I began its practice in 1860. My first 5 cases gave me a recovery of 60 per cent. I operated more than 700 times until 1887, and assisted my friends or assistants in more than 2,000 cases. After 1887 I rarely ever operated, and my friends stopped tracheotomy when O'Dwyer taught us all intubation. The short life of tracheotomy as a pediatric method has its history from 1860 to 1887. James J. Walsh, in "Makers of Modern Medicine," page 341 of his third edition, has the following in connection with O'Dwyer: "At the beginning, some of the specialists in children's diseases"—erroneously he calls me a specialist—"gave the new method of intubation a trial, yet without obtaining satisfactory results. Jacobi, in writing his article on diphtheria in Pepper's System of Medicine, contended that intubation could not be expected to accomplish all that was claimed for it. It was not long, however, before Jacobi realized his mistake in this matter and handsomely made up for it. While he was President of the Academy of Medicine, on opening a discussion on intubation before the Academy in 1886, he said that O'Dwyer's work deserved all possible praise and that his untiring devotion to the subject in silent patience until he had brought it to perfection was a model that might well be held up for the emulation of American physicians, commonly only too prone to announce discoveries even before they were made."

Similar remarks might be made in connection with that annual meeting of the Medical Society of the State of New York, in



which O'Dwyer demonstrated the anatomy and practicability of his method. In the Academy meeting the main speakers were Francis Huber, Dillon, Brown, Northrup and A. Caillé, besides a few others. In connection with intubation, Louis Fischer and others are to be mentioned—indeed all those who practiced on the larynges of children.

Very few New York doctors have ever attained the fame and position—in the opinion of the world—of O'Dwyer. His recognition, after his reception by the New York Academy, became universal. No one deserved it as he did. Every country participated in doing him honor.

I have been very fortunate in being connected with the history of pediatry in New York. When I made the acquaintance of Dr. Stephen Smith, the Editor of the New York Medical Journal, he opened his columns to me. For several years I had the pleasure of furnishing to him extracts from pediatric literature culled from foreign countries. Very soon he also took my original articles, among them one on the premature ossification of cranial sutures and fontanel, another on intussusception, and others. My ambition grew with my opportunities. That is why, in company with Dr. Noeggerath, I published in 1859 a book of more than 400 pages, under the title of "Contributions to Midwifery and the Diseases of Women and Children." It was well received and favorably criticised, but on account of the poverty of the authors it had to be discontinued in subsequent years. At about the same time I wrote for the Medical Times, mainly a dozen lectures, which in 1862 were collected and published under the title of "Dentition and its Derangements." In that book I convinced myself, and I hope many others, that dentition itself was no disease. I received the permission of lecturing in the summer course of the College of Physicians and Surgeons. My lectures were delivered under the title of "Diseases of the Infantile Larynx." You see that at an early time I had many facilities furnished by the profession for work and observation. The principal ones in those early times were those afforded by the new German Dispensary, which opened its doors in 1857, and which has continued all these years.

My opportunities came through the kindness of the professor of physiology, who for many years was also the dean of the P. & S. You may have met with his name, John C. Dalton, within the last few weeks in the Medical Record, in which Dr.



Sweet speaks of him in his otherwise careful and loving reminiscences. He speaks of him as deficient in his teaching faculties, which I am glad to be able to testify is a mistake. Sweet calls Dalton a "not inspiring lecturer." But, indeed, Dalton was one of the most eloquent teachers. I speak of that because, as a rule, genuine eloquence is a dangerous trait in a teacher, and he was very inspiring through the rapidity and beauty of his chalk delineations on the blackboard.

A change soon took place. The New York Medical College, which was founded in 1850 was reorganized in 1860. Through Dr. Charles Budd and other friends they offered me the full professorship of diseases of children, and after legitimate hesitation I accepted that place. That was the first professorship of the kind in the United States. With it came the recognition of *pediatry as a subject of coördinate title* in medical teaching.

In 1861 the Bellevue Hospital Medical College was founded, with J. Lewis Smith as clinical professor of diseases of children. In 1865 I transferred my work to the University Medical College, and in 1870, for reasons satisfactory to me and to the faculty of the College of Physicians and Surgeons, to that school. In both of them my position and title was that of clinical professor. I was quite satisfied with the possibility of doing work such as I liked and knew to be useful. Titles did not impress me much, nor do they to-day. I once received from my own faculty (New York P. & S.) a rebuke which caused me a smile, but a smile only. It happened this way. In one of the medical weeklies there appeared one of my lectures which had been stenographed by a kindhearted reporter. He gave me the title of Professor of Diseases of Children. That was a crime of *lèse-majesté*. I received a letter from the august faculty, in which I was told that that must not happen again. I must know I was no professor at all of diseases of children, but only a clinical professor. The poor devil—that is, I—had to acknowledge he never before saw the essay, but he would make it his business to warn the stenographer never again to call a mere clinical professor a real professor. A dozen or two decades afterward the same faculty gave me the title of Professor. I never knew the difference, though I feel certain I said "thank you."

The first genuine full professor in pediatry—together with a chair in the faculty—in any one of our medical schools was Thomas M. Rotch, of Harvard, in 1888. Still, many of

the seventy-five clinical teachers of pediatry in our American medical schools are nowadays full of professors; in New York City alone, there are those of Cornell and of the University of Bellevue and of Fordham. That my good friend and successor in my P. & S. Chair is a full professor, not in title only, but of big size, is known to you all. You are also aware of the fact that the full Chair of Theory and Practice, now and then called "Institutes," is not considered "full" enough, nor ever was, to teach diseases of children. The principal change means L. Emmett Holt.

Before that time Dr. Gunning Bedford was the Professor of Obstetrics and Diseases of Women and Children in the University Medical College. Under him, or alongside of him, he had a weekly woman's clinic. His was the real college clinic. His work was very popular with the class of women attending. When George T. Elliot took part in the regular organization of the Bellevue Hospital Medical College, it was he who recognized the desirability of special pediatric teaching. It was then that J. L. Smith gained his well deserved recognition. Elliot died very soon and left his colleague in his proper place. What he may not have accomplished to its full extent was in part done by Elliot, who was capable and social—indeed, a society man and influential in well-dressed circles. He traveled a good deal. In 1859 he brought with him from Edinburgh the first hypodermic syringes.

In society circles I did not succeed; indeed, my ways were always different—it may be to the disadvantage of what I may have considered my cause. I think I was not fit or willing, or able, to utilize my possibilities in the interest of children and infants and the cause. This is what happened:

In 1860 I was given a place in the Nursery and Child's Hospital. I treated the babies, and fed the babies and the women, and made autopsies—too many of them—and began the teaching of my assistants—one of them an able woman—but it was left to me to find a mortality of 100 per cent. and to try to correct it. So it happened that as no decent records were kept, it was my opinion that I should be judged by my opinions and nothing else. This was not a mistake, but a crime, and I was told to resign, but refused; told them I preferred to be expelled, and I *was* expelled, 1870, by my colleagues, most of whom I had appointed. I was blackguarded by low public papers and persecuted by my thirty-five fine lady managers, who told my private patients in town they must drop me as unfit. That, however, they did not do.

One of the great progresses of pediatric teaching is as follows: It suffered, like all our clinical teaching, from insufficient methods through the absence of bedside teaching. The first genuine systematic bedside instruction in New York City dates from 1862. In 1860, as I have told you, I joined the faculty of the reorganized medical college. A few of us—not I—had money; some had rich friends, all of us had ideas. We all knew our teaching was insufficient: that is why in our college building on East 13th Street we vacated a floor and substituted a mixed hospital of about twenty-eight beds. In that small hospital we taught our advanced students many hours every day, and taught them how to work. If ever you will recall for yourself and your friends the first, the very first beginning of medical bedside instruction in America, please tell them of the small college on East 13th Street—I believe 118—which had to close its doors in 1864, a victim of the Civil War, which deprived us of all our Southern students. That is part of your American medical history worth remembering.

I was permitted to be quite active in that successful enterprise, and utilized my opportunities in preferring my pets, the young patients. My later experience will teach you that successive bedside teaching was almost exclusively pediatric. Thus pediatry was the example of giving correct medical instruction.

Dr. Francis Huber was an assistant of mine in the College of Physicians and Surgeons for about thirty years. In 1898 he approached me with his plan of placing at the disposal of the P. & S., or rather the Columbia University, a capital, the income of which was to pay Roosevelt Hospital and to serve for the bedside instruction of the P. & S. advanced students. I advised against it. He said: "If it had not been for you and through you for my connection with the school, I should never have been able to earn this money; and here is the money, and for that purpose." That was Francis Huber, and that he is to-day. An agreement was made between Columbia and Roosevelt, and bedside instruction, with first twelve and afterward sixteen beds, resulted therefrom. For me personally, for whom the service was named, the result was, as the small Roosevelt service was a daily one, my giving up my large Bellevue and my German Hospital general service. For no man should, or honestly could, serve two masters at the same time. Thus *the second regular bedside instruction* was established, after an interval of thirty-five years. It lasted a few years only; it is useless to study the



history of the college and the hospital at those, in part, troubled times, and the second period of bedside instruction terminated in that way.

A *third period* dates from 1910. About that time a good benefactress of the city, Mrs. A. Woerishoffer, gave the German Hospital one hundred thousand dollars, to which she added much more afterward, for the foundation of a children's hospital. That far-seeing woman provided for a hospital of fifty or more beds, the patients to be babies or twelve years old or less, medical cases mostly, nurses to be taught. The condition was included of teaching nurses and students and doctors. Here was your bedside instruction, ward instruction in its third edition, which has existed these five or six years. The hospital, "The Jacobi Division," as the benefactress wished it to be called, was established as ordered. A contract admitted small classes, of from five to eleven students each, from the P. & S., selected by the faculty, for two hours in the afternoon; first those of the third year, at present those of the fourth year, for which the annual interest of the Francis Huber capital is being paid to the German Hospital, as formerly to Roosevelt. The attending physician, Dr. A. L. Goodman, and his two adjuncts, Dr. Leopold and Dr. Moffett, are equally interested in the duties belonging to them as part of their obligations, eagerly accepted. That service has attained a well deserved reputation. As a specimen, I present, as part of American therapy, Goodman's treatment by autoserum of chorea, which was published in the September number of ARCHIVES OF PEDIATRICS.

*19 East Forty-Seventh Street.*

NOTE.—During the coming year ARCHIVES OF PEDIATRICS expects to have the pleasure of presenting to its readers other articles on kindred subjects by Dr. Jacobi.

A PREVIOUSLY UNDESCRIBED FORM OF POSTDIPHTHERITIC PARALYSIS—Frieda Lederer (Arch. f. Kinderheil., Bd. LXV., Heft III.-IV., 1916) gives the history of a case of diphtheria, in which postdiphtheritic paralysis occurred in some of the usual locations, followed by a one-sided hypoglossus paralysis characterized by lateral deviation of the tongue, and lack of taste on one side of the tongue, while temperature, touch and pain reactions in both sides of the tongue remained normal. After electrical treatment these troubles disappeared, as did the hypoglossus symptoms later.—*Amer. Jour. of Obstetrics.*

## THE PROBLEM OF THE CARDIAC CHILD IN NEW YORK CITY \*

BY L. EMMETT HOLT, M.D.  
New York

The late Dr. Huddleston, in whose untimely death one year ago many medical and sociological interests lost an ardent and intelligent worker, was one of the first to have a vision of the problem of the cardiac child in New York and to take steps looking toward the solution of this problem.

Early in the winter of 1914-15 he organized a committee to consider this question. Several meetings were held and various phases of the problem were discussed. The committee appealed to the Public Health Committee of the New York Academy of Medicine, whose executive secretary made a survey of hospitals in the city in which children with cardiac disease were treated. Responses to his questionnaire were received from five institutions having a pediatric service, from which it appeared that during the previous year 212 patients were treated in the wards of these institutions with 36 deaths. No reports from out-patient clinics that could be relied upon were available.

There the matter rested, so far as this committee was concerned, until after Dr. Huddleston's death, when a group of his former patients and friends collected a fund, the income of which it was decided to devote to the study of the problem of the cardiac child. This committee has during the last year been collecting data which are of considerable interest. It was evident, from the reports of the hospitals obtained through the committee of the Academy, that but a very small proportion of the cardiac cases were treated in hospitals, and it turned to the public school records of the Health Department for further information. The results of the investigations of the Division of Child Hygiene have been kindly placed at the disposal of the committee by its director, Dr. Baker.

There were registered in the public schools of New York City in 1915, 802,338 pupils, and in the parochial schools, 136,116, making a total of 938,454. Under the supervision of this Division it has been the custom of the Health Department to make routine

\* Read at the New York Academy of Medicine, Section on Pediatrics, December 14, 1916.

examinations for physical defects of about one-third of the children in the public schools each year. In 1915 there were 278,174 who received a complete physical examination. Of this number 1.5 per cent. were found to have some form of organic heart disease. In Public School No. 89 in Brooklyn, in 1915, of 1,189 children examined, 1.9 per cent. had organic heart lesions; in another Brooklyn school, No. 92, of 1,988 children, 1.7 per cent. were so affected. Most of these school examinations have been made with the handicap that the physicians have not been allowed to remove the clothing from the chest. To correct the error which thus might be made, single schools have been taken from time to time and a more thorough examination of the chest made of the children with the clothing removed. The results, however, have not differed essentially in the two kinds of examinations. It is the opinion of the Division of Child Hygiene from the data thus obtained that about 2 per cent. of the children in the public schools are suffering from organic heart lesions.

An independent investigation was conducted in 1915 under Dr. H. V. Guile in the Bellevue district. There were examined 1,333 children from Public Schools Nos. 14 and 116. These examinations were made by two or three different physicians and the cardiac cases discovered were subsequently re-examined by Dr. Guile himself. In this group there were found a percentage of 4.5 children with organic cardiac lesions, and 1.7 per cent. with functional murmurs. From these findings it would appear that results given of the routine examinations of the Health Department have considerably understated rather than overstated the percentage of cardiac cases in the public school children of New York.

On the basis of only 2 per cent. the total number of cases in public school children would be about 20,000. To this number must be added the cases occurring in children below the school age, those too sick to be included in any of the school examinations and those in the private schools of the city.

From all these considerations, that 25,000 children in New York are now suffering from organic heart disease would seem to be a very conservative estimate. With more thorough examination this number would probably be increased rather than diminished. An army of 25,000 children marching up Fifth Avenue would make an impressive spectacle, and would visualize for the public the magnitude of the problem of the cardiac child

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in New York City. It would make a powerful appeal to us who realize how casual is the medical advice which most of these children receive and how entirely inadequate is the care and supervision which they are given in the home.

This problem of the cardiac child has medical, educational and economic aspects, all of them very important, and any one of them too large to be discussed at length in this brief paper, whose only purpose is to bring the whole subject prominently before the minds of the pediatricists of New York.

Much interest and a great deal of well-deserved sympathy has recently been aroused in this community for the unfortunate children who have been crippled as a result of the recent epidemic of infantile paralysis. But it should be remembered that the cardiac child is also a cripple, handicapped like the victim of poliomyelitis both in his education and in his opportunities for earning a livelihood. We who are interested in the cardiac child and who see every day in hospitals and out-patient clinics the consequences of neglect and bad management both in the home, in the school and in the street should lose no opportunity to place before the public the needs of this class of patients—these little cripples whose deformities, though concealed from view of the passerby in the street, are none the less real.

Although a special clinic for adult cardiac cases was organized in Bellevue five years ago under Dr. Guile, this group of patients has received but little particular attention until within the past two years, which have seen the formation of a Society for the Study and Prevention of Cardiac Disease and the opening of special clinics for cardiacs in the Brooklyn Hospital, Roosevelt, New York and the Post-Graduate; nearly all of these clinics are less than a year old. A number of others are now being organized. Though organized primarily for adults, in several of them children are also received. About three years ago Dr. Ferguson made a beginning of segregating cardiac cases for special observation in the Out-Patient Department of Bellevue. The first fully organized, separate cardiac clinic for children was that of Dr. St. Lawrence at St. Luke's. This work was begun a little over a year ago. In July last Dr. Charles Hendee Smith organized a similar clinic in the Out-Patient Department of Bellevue. At present, so far as I have been able to ascertain, these are the only cardiac clinics for children in New York City. There is one in Boston in connection with the Massachusetts General Hospital



which has been in operation about two years. It includes in its care, as do others, not only active cardiac cases, but those of chorea and other rheumatic affections in which the development of cardiac lesions is likely.

The problem of the cardiac child, at least in its medical aspects, is essentially an out-patient problem; but very little can be accomplished in its solution by desultory, old-time, dispensary methods. It requires efficient organization with facilities which will make possible continuous observation of the children over prolonged periods, careful examinations, accurately kept records and the coöperation of an adequate staff of visiting nurses and social workers; all of these are essential to the success of such a special clinic. Very much is yet to be learned about the management of this class of patients who must live in the tenements of New York, obtain their education in our public schools, and finally either be provided with special vocational training, which will enable them to be self-supporting, or, if this is not furnished, become public charges in our institutions.

The Board of Education is also being aroused to the importance of this problem, and questions of exercise, of separate classes, open-air classes and open-window classes are already receiving attention. The philanthropic public as yet knows but little of the needs of the cardiac child. All agencies assisting these children look to the medical profession, and the medical profession looks to the pediatricist to decide exactly what had best be done with and for these children, and how it should be done. Certainly there is no more fruitful field for study than management of the cardiac children of a great city.

*14 West Fifty-Fifth Street.*

## DIATHESES IN THEIR CLINICAL ASPECT

BY AUGUSTUS CAILLÉ, M.D., F.A.C.P.

New York

Diathesis may be defined as a bodily condition or constitutional anomaly which predisposes to other pathological conditions. Some diatheses are inherited and others may be acquired; both may be overcome by reconstructive efforts, hence the importance of their clinical consideration.

**ASTHENIC DIATHESIS**—*Asthenia universalis* is a term used in connection with individuals who have degenerated physically and show marked dyspepsia and neurasthenia. When born into this condition they represent the sins and mistakes of former generations. Acquired asthenia is the result of a faulty hygiene, which frequently dates back to infancy and childhood and by reason of inertia of the individual remains uncorrected as the years go by. What precise rôle the internal secretions play in this class of cases has not as yet been established.

B. Stiller, of Budapest, emphasizes that *asthenia universalis* is a widespread constitutional defect in the sense that it depends on hereditary tendency.

Its attributes are *enteroptosis, nervous dyspepsia, severe disturbance of nutrition without sufficient external cause*, atony of the stomach, intestinal atony, flaccidity of all tissues, neurasthenia.

The tendency shows itself in the atonic habit of the child, delicate skeleton, long, flat thorax, oblique ribs, small epigastric angle, and, as a concomitant of the asthenic thorax, looseness of the costal girdle due to congenital defect of the tenth costal cartilage, which produces a floating tenth rib (normally fixed).

**Management**—Reconstructive efforts in the interest of asthenics can and should be made early, and if conditions are favorable for a change of environment from city to country, this change should be advised, because asthenic individuals of either sex find city life too strenuous. Adults should wear a supporting belt or an "uplift" corset to counteract enteroptosis.

**SCROFULOUS, STRUMOUS**, now sometimes called *exudative diathesis*, is a derangement of childhood; it affects the lymphatic system and shows painless swellings of the lymph glands,

especially of the cervical lymph nodes, transparent skin, anemia, geographical tongue, weak musculature, also eczema, milk crust, prurigo and other skin affections, a great tendency to catarrh of the mucous membranes, bronchitis, enlarged tonsils and adenoids, angina and false croup.

The affection is thought to be due to faulty metabolism and faulty assimilation, sometimes overfeeding, autointoxication, poor hygiene, etc. It has been suggested that scrofula is the expression of a chronic toxemia of a former generation, without bacillary involvement of the scrofulous offspring (as in tuberculosis or in syphilis). Not infrequently apparently well nourished infants present the symptoms of scrofula in a marked degree; in fact, there are two types of scrofulous children—one group is thin and undernourished, the other is fat and pasty.

Scrofula predisposes to, but is not necessarily associated with, *tuberculosis*.

*Prophylaxis* consists in cleanliness of the mouth, regulation of the bowels, care in feeding, ventilation, sunshine.

*Treatment*—Towards puberty scrofula often heals spontaneously. Before this time complete recovery is rare, though the condition may be very considerably improved, so that the inflammatory and most other symptoms disappear. This may be accomplished by fresh air, including sleeping in the open, sunshine, daily baths, cleanliness, correction of a tendency to diarrhea or constipation, careful feeding. It is well to restrict the quantity of food given if the baby is very plump. In other cases a change of diet and addition of articles which are readily absorbed is advisable. In older children a vegetarian diet and restriction of *fat* is advisable. Butter should be substituted for cream.

Of drugs, codliver oil, iron, syr. ferri iodidi, gtts. x-xxx three times a day, and Fowler's solution of arsenic gtt. 1-3 twice a day, are advisable.

*Atropin Treatment* for the various manifestations of the exudative diathesis has given good results. One drop of atropin sulphate solution (gr. 1 to oz. i of water) is given three times a day for about three weeks.

**LYMPHATIC DIATHESIS**—This condition, variously called status lymphaticus, status thymicus, status thymico lymphaticus

and lymphatism, presents a complex symptomatology of which the symptoms referable to thymus gland enlargement are the most prominent.

The condition usually presents hyperplasia of the thymus gland, the tonsillar ring, the lymphatic elements of the spleen, lymphodes, the lymphatic follicles of the digestive tract and the lymphoid marrow of the long bones.

Babies found to be suffering from status lymphaticus require extra care in their management. They should not be subject to operations, unless imperative, as sudden death has frequently occurred from fright, immersion into cold water, injection of antitoxin, chloroform and other anesthetics, etc.

*Treatment of Status Lymphaticus*—Apart from general hygienic management nothing noteworthy in the way of specific treatment has been suggested. X-ray treatment of an enlarged thymus gland seems to be of value.

**CHOLESTERIN DIATHESIS** (Gall-Stone Diathesis)—Newer investigations make it plausible that in certain persons a surplus of cholesterin formation (cholesterinemia) takes place in the blood with subsequent deposit of concrement in the gall bladder. Further investigations are necessary regarding this theory and eventually we may be in a position to suggest prophylactic measures against gall-stone formation.

**SPASMOPHILE DIATHESIS** is a term used in connection with individuals, mostly children, who are prone to have tics, fits, spasms, tremors, *convulsions*. The so-called *spasmophile reaction* is an opening anodal response to weak galvanic currents of 1-5 milliampères. This reaction is usually not present in true epilepsy, either petit or grand mal.

The spasmophile tendency gradually wears off and may be entirely gone at the age of puberty.

*Management*—Hygienic living, hydrotherapy, judicious hardening and proper feeding are our reconstructive efforts. A positive Wassermann reaction would indicate antiluetic treatment.

**VAGOTONIC DISPOSITION OR DIATHESIS**—Vagotonia is a form of constitutional inferiority which may disappear and reappear and usually improves with advancing age. It may be defined as a morbidly exaggerated tonus in the autonomic nervous system.



and in all probability it bears an intimate relation to anomalies of endocrine glands.

The vagotonic disposition may be general (nervousness) or local (localized spasms).

Internal secretions have a regulating or disturbing influence on the autonomic system, the precise nature of which is at present unknown. In constitutional vagotonia we usually find a lymphatic diathesis with persistence of the thymus gland.

The clinical evidence of vagotonia in children manifests itself in many ways: Salivation, tendency to sweating, dermographies, laryngospasm, stomach unrest, bowel unrest, nervous diarrhea, spastic constipation, reflex anuria, poliuria, etc.

*Prophylaxis*—Inasmuch as a slumbering vagotonic disposition may develop into the active state by overstrain at school, etc., hygienic plain living and avoidance of overstrain should be attempted.

*Treatment* of this condition is practically the same as for neurasthenia. For the spastic states *atropia* given internally in small doses has proved itself of very great value. Endocrine gland therapy for vagotonia awaits development on a practical basis.

In *vagotonia and psychasthenia* combined, suggestion therapy is salutary.

ARTHRITIC, LITHEMIC, URIC ACID DIATHESIS is a term used to indicate a condition of an abnormal or increased amount of uric acid or urates in the blood and where there is tendency to the formation of gouty deposits. The management of this condition is practically the same as in gout and in autointoxication.

RHEUMATIC AND CHOREATIC DIATHESIS is a term used to indicate a susceptibility to rheumatic and choreatic manifestations. In children so constituted, enlarged tonsils should be reduced, adenoids removed and regular bowel action secured. The living room should be airy and light and a judicious hardening process should be instituted at an early age.

HEMORRHAGIC DIATHESIS—This constitutional defect must not be confused with the acquired hemorrhagic condition which develops in persons suffering from scurvy, chronic nephritis, chronic hepatitis with jaundice and cholemia and which may accompany severe acute infection and sepsis.



Hemorrhagic diathesis proper occurs in two forms—that of the *newborn* and that known as *hemophilia*. Hemorrhagic diathesis of the *newborn* is a congenital disease in which there is present a tendency to hemorrhage from the smaller blood vessels, *e.g.*, from the navel, mucous membranes, especially of the mouth, stomach and the intestines, of the skin, genitourinary tract and meninges. It occurs very early, sometimes at birth, and the diagnosis is made on the appearance of the hemorrhage. If the hemorrhage is severe the child is restless, a rapid, feeble pulse develops, with an early collapse. The disease is said to depend on some alteration in the blood or blood vessels, but no precise information of the cause exists. Syphilis or some other bacterial infection of the mother is probably the underlying factor.

*Treatment*—The indications for treatment are: stop the hemorrhage, replace the loss of blood, and overcome any underlying infection or toxemia. Direct transfusion practically meets all three indications. Crile's technic consists in connecting the radial artery of the donor with a superficial vein of the patient. The injection of fresh human *blood serum* or *horse serum* into the buttocks of the infant in amounts of 10 c.c. every few hours, gives good results. An equally simple as well as successful method consists of the subcutaneous injection of whole blood, as advised by Schloss and Comiskey. Small amounts, 3 to 10 c.c., of blood are withdrawn from a convenient superficial vein of the mother or any other healthy adult, by means of a sterile Luer syringe and injected as whole blood into the buttocks of the child, where it is quickly absorbed into the circulation. Direct transfusion can also be accomplished by the syringe-cannula method, but direct transfusion implies a previous hemolysis test for which there is usually no time. When fresh human or horse serum is not obtainable a sterile dry preparation, which is in the market under the name of *Coagulose*, may be used.

Hygienic living and the proper treatment of the intercurrent disturbances during pregnancy are the rational antenatal preventive measures to be adopted in all cases by expectant mothers.

**HEMOPHILIA**—There is an innate condition characterized by a tendency to uncontrollable hemorrhage after slight wounds. There is often an associated arthritis.

Individuals inheriting this tendency are known as *bleeders*. Slight cuts, traumatic lesions, tooth extractions, etc., are followed

by hemorrhages which prove more difficult to control the oftener they occur. A blood examination shows, among other changes, a prolongation of the coagulation time of the blood.

*Prophylaxis*—Treatment begins before birth and includes hygienic living of the mother, as emphasized in the previous remarks on hemorrhage of the newborn. The prohibition of marriage of females closely related to hemophilics seems to be advisable, as it is through them that the hemophilic diathesis is transmitted to males. Bleeders should protect themselves from all forms of trauma. They should consider well the dangers of surgical operations. They must be encouraged in hygienic living and should harden themselves by cold douches and cold sponge baths.

*Treatment*—Immediate measures in the case of hemorrhage are *absolute rest* and *local pressure*. If the source of hemorrhage is accessible the application of fluff or plugs of gauze or pledgets of cotton soaked with adrenalin solution or alum solution, or *thrombo-plastine*, combined with strong manual pressure directly to the wound is advisable. Pressure with a tampon saturated with a 10 per cent. solution of antipyrin will usually stop capillary hemorrhage. When the hemorrhage is especially obstinate additional pressure should be exerted proximally over the larger tributary vessels of supply. Cases of internal hemorrhage, *e.g.*, from the stomach and intestines, should be treated with ice externally and with adrenalin solution or tannic acid or acetate of lead (gr.  $\frac{1}{2}$  to ii every four hours) internally. Of late the introduction of blood serum has brought a very hopeful aspect to the treatment of hemophilia. While the serums of various animals have been used, most effective is the serum of human beings. Next, that of the horse. Antidiphtheritic or antistreptococcic serum may be used in an emergency. Human serum should not be employed without a previous Wassermann test. Serum can be given intravenously (10 to 20 c.c.) or subcutaneously (30 to 40 c.c.). The benefits of the serum are apparent within forty-eight hours and are said to continue from five weeks to indefinite duration, the coagulation time of the blood eventually becoming normal. To prepare hemophilics for operation 10 c.c. of fresh animal serum should be given as a preparatory measure daily for a few days.

## THE HOSPITAL CARE OF PREMATURE INFANTS \*

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At the outset I wish to say that this is not a general discussion of the subject, but a résumé of my personal experience in the observation and treatment of these cases.

In the past two years there have been admitted to the infants' ward of Bellevue Hospital 278 premature infants. Of these, 13 are still in the warm ward specially provided for premature infants and 265 have been discharged. There are three reasons for the very large number of this class of patients admitted to Bellevue: First, because there is a large maternity ward on the floor just above the infants' wards; second, because Bellevue is a city institution, to which the police department brings all the foundlings, and third, because the hospital is known to have special facilities for taking care of these tiny patients. There is, so far as I know, no other institution, either here or abroad, that has so many such cases.

These mites are brought to us in the most diverse and curious wrappings; some beautifully swathed in cotton and warm flannels, with hot-water bottles around them, and many others stiff and blue from exposure and insufficient covering. Naturally, many of the latter have received so severe a shock that the small spark of life cannot be fanned into a sufficient flame; it flickers for a day or so and then goes out. This means that the mortality is very high, and the most of it during the first few days after admission to the hospital. But a great deal can be done for even the smallest and feeblest of them, and it is on this account that a consideration of the measures we have found most useful may be of interest to all who are called on in private work to care for these interesting little patients.

I have recently gone through the records of the last 200 patients discharged and find that there were 30 saved, discharged cured, as we say; that is, they were discharged from the hospital in strong enough condition and with sufficient weight to make it probable that their mothers could care for them successfully. Of the 170 that died among these 200 cases, 90 died on the first

\* Read at the Twenty-eighth Annual Meeting of the American Pediatric Society, held at Washington, D. C., on May 8, 9 and 10, 1916. From the Infants' Service, Bellevue Hospital, New York.

day, many within an hour or so of the time of admission; 28 more died on the second and third days, making 118 that died in the first three days. This means that there were 30 that lived out of the 82 strong enough to survive the first three days of life, that is, 36 per cent. were saved of those that survived beyond three days. Of those that died, the baby with the highest admission weight was an infant weighing 4 pounds, 14 ounces. This baby died of general septicemia. One baby reached 4 pounds, 10 ounces and died of gastroenteritis. Another gained from  $2\frac{1}{2}$  pounds up to 4 pounds and then died of acute bronchitis. Still another gained from 2 pounds, 3 ounces, its admission weight, to 4 pounds, 11 ounces, then it had an infection and died in a few days, much to our chagrin. The lowest weight of those that died was 1 pound, 1 ounce, that of an infant of five and a half months' uterogestation. There were many that weighed from 1 pound, 12 ounces to  $2\frac{1}{2}$  pounds.

The smallest infant that was discharged cured had an admission weight of 2 pounds,  $13\frac{1}{2}$  ounces. The baby remained in the hospital seven months and weighed 5 pounds,  $6\frac{1}{2}$  ounces at the time of discharge. The next smallest baby that was discharged cured weighed 3 pounds on admission and after four months in the hospital was discharged weighing 5 pounds, 5 ounces.

Three years ago, while visiting the children's clinics on the Continent, I learned that in Paris the smallest premature infant they had reared successfully weighed 800 grams, and in Berlin, at Langstein's Hospital, an infant of 750 grams, a case of L. F. Meyer, had been successfully reared. It is most unusual, however, that any baby weighing less than  $2\frac{1}{2}$  pounds is saved. The smallest child reported saved is that of Rodmann, weight 719 grams.

The great majority of the babies admitted to the premature ward have a history of uterogestation between seven and seven and a half months. But it must be emphasized that the history is not to be depended on. In our experience, in cases in which the history has seemed more than usually reliable, babies of six months' uterogestation weighed from  $1\frac{1}{2}$  to 2 pounds; those of seven months weighed from  $2\frac{3}{4}$  to 4 pounds, and those of eight months weighed from  $4\frac{1}{2}$  to  $5\frac{1}{2}$  pounds.

These are to be taken only as general averages; there are many exceptions, both in the direction of the earlier born weighing more than these figures, and of the later born weighing less.



This is particularly true in the case of multiple births, such as twins or triplets.

TABLE I.

## LENGTH OF BABIES OF VARIOUS WEIGHTS, ON THE AVERAGE

Weight, Pounds	Length, Inches	Length, Cm.	Weight, Pounds	Length, Inches	Length, Cm.
1½	11 to 12	28 to 31	4	16½ to 18	42 to 46
2	13½ to 14½	34 to 36	5	18 to 19	45 to 48
2½	14 to 15½	36 to 40	6	19 to 20	48 to 51
3	15 to 16	38 to 41	7	20 to 21	50 to 54
3½	15½ to 16½	39 to 42			

*Causes of Prematurity*—Aside from mental or physical shock, the result of an accident, the causes of prematurity are, briefly, syphilis, some acute disease in the mother, extreme youth of the mother or of both parents, and connected with this, illegitimacy. The occurrence of twins or triplets or other multiple pregnancies is a very important factor.

*Symptoms*—Aside from the small size and weight of the premature baby, the usual symptoms manifested are, in the first place, extreme muscular feebleness, which extends even to the muscles involved in sucking and swallowing. Inability to nurse, that is, to make sufficiently strong suction to withdraw the milk from the mother's breast, is the regular condition, and in very many instances it is the underlying cause of fatal inanition; that is to say, the mother may, after a few days, have abundant, normal milk and the baby may have a good digestion, but on account of feebleness of its muscular power the baby is unable to obtain the nourishment.

Another symptom manifested by nearly all of these babies, partly on account of their small size, but for other reasons which will be mentioned, is a temperature far below normal. The skin is imperfectly developed and the subcutaneous fat is deficient or lacking, so that the baby radiates more heat proportionately than an infant of normal size. Again, the heat regulating center seems not to be in satisfactory operation, so that the baby is thermolabile, very susceptible to the heat changes of its environment. With regard to the skin, babies born very early may have a skin which is partly translucent, having the appearance of solidified gelatin. These babies with gelatinous skin are seldom able to survive.

Another symptom which these babies show is a great tendency to attacks of cyanosis. This in some instances is due to pressure



of the clothes or the weight of the arms on the chest, but in other instances it seems to be related to the feeble muscular power and easy fatigue which the muscles of respiration undergo. The attacks may be so serious as to prove fatal, so that constant care is necessary to prevent bad results. Another cause of cyanosis is insufficient food.

These babies also have an extreme susceptibility to all sorts of infection. The skin and mucous membranes are very permeable to germs, so that extreme care is necessary to prevent abrasions and to avoid contagion from other persons or from contaminated clothing or apparatus.

Absorption from the gastrointestinal tract of deleterious substances, whether as the result of fermentative processes in the intestines or of germ infection, may cause profound and even fatal disturbance in a very short time. General sepsis may arise from this source or may come from the umbilical wound or from abrasions of the skin. On the other hand, occasionally one sees localized infections that cause comparatively little disturbance. This principally occurs in the hands and feet, where the blood supply is very good.

Not always, however, does a serious disease prove fatal to the premature infant. Baby 786, weighing 4 pounds, had an attack of bronchopneumonia, with temperature ranging up to 104°F. for over a week, recovered and afterward gained in weight and was discharged from the hospital in good condition.

*General Management*—So far as is possible it is the aim in the general management of the baby to reproduce the conditions of intrauterine life, conditions which the baby should have been entitled to until the ordinary full period of intrauterine development; that is to say, the baby should be kept in an even temperature approximating that of the human body and should be shielded from all sorts of external shocks, whether thermal or mechanical. The skin should be protected from chances of contagion and injury and the eyes should be protected from light. The inhaled air should be moist and comparatively warm and as free as possible from germs, and the food should be such as to require the least possible amount of digestive effort on the part of the baby. To secure as far as possible the conditions mentioned, certain specific factors are of the greatest importance. First, *the temperature of the environment*. This is much more readily managed in summer than in winter, but with a little care

and attention very satisfactory conditions can be obtained, even in any home. The first question that will arise on the part of the family and the physician in the management of a premature baby is whether or not it should be put into an incubator. My experience with most incubators and their methods of management would lead me to give a decided negative to this question. Incubators are expensive; they are complicated. It is inconvenient to change the baby's clothing while it is in an incubator, and, most of all, an incubator is difficult to ventilate and to keep free from germ contamination. Moreover, to keep the temperature equable in them and the ventilation proper requires a nurse who is thoroughly familiar with the use of the particular incubator installed.

As regards incubators, probably the most satisfactory one up to the present time is that devised by Dr. Edwin B. Cragin and described in the *Journal of the American Medical Association* for September 12, 1914. Dr. Cragin devised his incubator to overcome the objections he had to others, namely, insufficient air space, insufficient circulation of air and difficulty of maintaining a constant temperature. Accordingly he made his incubator much larger, holding two basins arranged with electric fan to draw through a current of filtered air and made use of a series of electric bulbs for heating. The air is moistened by evaporation of a pan of water placed in the lower part of the incubator. A thermometer and a hygrometer show the heat and moisture. Altogether, however, there are so many disadvantages in the use of incubators, as compared to their advantages, that the plan of setting aside a small room as an incubator room and having that kept at the proper temperature is much more satisfactory in every way. Here the baby does not have to undergo any chilling when the clothing is removed for any purpose.

The most complete incubator rooms have the air drawn in front doors from some uncontaminated source (in cities usually best from the roof) and it is then warmed, filtered and moistened. The temperature of the room is regulated automatically and the degree of the heat can be adjusted. Such an installation is quite expensive. The Babies' Hospital in New York has such a room, which was installed under Dr. Holt's direction.

At Bellevue Hospital, because of the prospect of entirely new children's wards, a very simple and inexpensive premature ward was devised for temporary use. The sunny corner of a ward

facing southwest was partitioned off and double windows with transoms were installed and the number of radiators was increased, so as to furnish sufficient heat on the coldest days. Ventilation was secured by means of the transoms and the door leading into the rest of the ward, where three wet-nurses and their babies have their beds. The premature room has a capacity of ten cribs, with a cubic air space of 1,000 feet per crib. Moisture for the air is obtained by keeping a large pan of water simmering on an electric stove. After much experimenting we found that the babies do best, as a rule, when the temperature is kept from 76° to 80° F., with a humidity between 60 and 70 per cent. Without this degree of moisture the room temperature had to be much higher, and even then the babies' mouths got very dry, and their appetites and digestion did not seem so good. Very feeble infants are not only wrapped in cotton, but hot-water bottles are put at the bottom and sides of the crib until the baby gains enough strength to keep an even temperature without them. Few need the bottles for more than a week.

Incidentally, we have found the warm ward of the greatest advantage in managing feeble infants that are not premature, such as those weighing 6 pounds at six months and having a subnormal temperature. On being put into the warm ward the temperature comes up to normal and they soon begin to assimilate and utilize the same food which seemed to be of little use when their temperature was subnormal.

The baby should be handled only when absolutely necessary. For the first few days after the initial anointing with oil there should be no undressing of the baby, the only handling being that necessary to change the gauze diaper. The clothing should be the simplest possible. Babies under 4 pounds are best wrapped in cotton and kept so swathed until the temperature remains constantly at normal and the weight has risen to 4 or 4½ pounds.

After the initial sponge bath and oiling no bath needs to be given for four or five days; then a sponge bath may be given every other day for a few days, and later every day.

*Diet and Method of Administration*—Of equal importance with the maintenance of body heat is the diet and its administration. In order, then, to feed these babies we must put the food into their mouths and often even into the stomach. In general, the most satisfactory means of administering the food is to use



a Breck feeder. This is a large graduated tube with a rubber bulb at one end and a small nipple at the other. After the warm food is put into the tube, the nipple is inserted into the baby's mouth, the bulb adjusted and then slight pressure will express a small amount of food through the nipple into the baby's mouth. This has the advantage of teaching the baby to draw on the nipple, but without exhausting the baby's strength. Feeding by the medicine dropper is not nearly so satisfactory, because it does not teach the baby the proper movements of the tongue and lips, and because, also, it is a much slower method of administering food. In some cases the baby cannot swallow satisfactorily and then it is necessary to resort to gavage, a very small, soft rubber catheter being passed through the mouth or through the nose. It is found that the baby is less apt to vomit when it is passed through the nose.

The food which is most suitable and requires the least digestive effort on the part of the baby is, of course, breast milk, but even this must usually be diluted and perhaps even predigested. At Bellevue three wet-nurses are kept constantly to furnish milk for the premature babies, and often additional breast milk is bought from women in the neighborhood. This is a good charity for both the women and for the hospital baby. In all private cases the effort should be made to secure good breast milk, either obtained from some maternity hospital or, better, from a wet-nurse who is in the house along with her own baby. This last is necessary in order to keep the breast milk from drying up. The milk is to be expressed from the breast two or three times a day and a requisite quantity mixed with either whey, barley water or gralum water as a diluent and then fed to the baby from a Breck feeder. The mixture of breast milk which we generally employ in our premature wards in Bellevue Hospital is for the first few days one-half whey and one-half breast milk, 1 ounce being given every one and one-half or two and one-half hours, depending on the size of the baby and its stomach capacity. After a few days the strength of the breast milk is increased to three-fourths, from 1 ounce to  $1\frac{1}{2}$  ounces being given seven or eight times in twenty-four hours. We have had no success with the four-hour interval. On this food the babies will usually gain quite satisfactorily, though at first very slowly, and one should not be discouraged if the increase in weight is not more than  $1\frac{1}{2}$  or 2 ounces per week. So long as the baby is comfortable and has a

normal temperature one should be quite satisfied with such a gain. Later the breast milk can be increased to full strength and the quantity given in twenty-four hours also increased, so that the baby will be taking 2 ounces every three hours. This should be sufficient food for a baby weighing  $4\frac{1}{2}$  or 5 pounds. If it is impossible to obtain breast milk one must then make use of some cow's milk modification. We have found it most satisfactory to use 6 per cent. top milk as the basis of the modification and to dilute this at first with whey or with a gruel made from Imperial Granum; often both the whey and the granum are used as a diluent. Five ounces of 6 per cent. milk, 10 ounces of whey and 5 ounces Imperial Granum water are used to make up a 20-ounce mixture. To this is added either milk sugar or more often dextri-maltose in quantity from  $\frac{1}{2}$  ounce to  $1\frac{1}{2}$  ounces.

If the baby is very feeble, the food is always boiled to prevent the formation of firm casein curds, and also predigested with a pancreatic extract for the purpose not only of peptonizing, but also for the purpose of emulsifying the fat and converting into maltose part of the dextrin and starch in the diluent. Occasionally we have made use of potassium carbonate, 3 or 4 grains to the day's feeding, as an alkali to prevent any chance of acidosis, and occasionally also we have made use of sodium citrate, with the idea of hurrying the food through the stomach into the intestines.

The number of calories per kilogram required by premature babies is, as would be expected, much higher than for babies at full term. We have found by experience that giving the usual 100 calories per kilogram seldom results in a satisfactory gain. On the contrary, on account of the greater proportional surface area it is usually necessary to increase the number of calories from  $1\frac{1}{4}$  to  $1\frac{1}{2}$  times the ordinary requirements. In looking through the charts it is found that most of these premature babies do not gain until the calories per kilogram have reached at least 120 and frequently as high as 170 or more per kilogram. As the baby increases in weight and its subcutaneous fat increases, the caloric requirement diminishes, so that by the time the weight of 5 pounds is reached the calories may generally be safely reduced to 110 or 120.

An important accessory apparatus in the premature room is a tank of oxygen all coupled up and ready for instant use in case of cyanotic attacks. It often proves life-saving.



*Prognosis*—As to this, the period of uterogestation is of great importance, but not entirely conclusive. The weight is the best criterion, but we must not despair of even the very smallest babies. If the baby weighs under 3 pounds the chances are very poor; every ounce over 3 pounds improves the prognosis. I have already mentioned cases of babies weighing 2 pounds, 3 ounces and 2 pounds, 13 ounces that gained most satisfactorily. Another baby on admission when five days old weighed 2 pounds, 10 ounces, and at the age of one and one-half months had gained only 1 ounce, weighing 2 pounds, 11 ounces. It became a very strong, vigorous infant, weighing 4 pounds, 13 ounces before it left the premature ward, and was graduated from the hospital at the weight of 5 pounds. It must be remarked here that if the baby is over one week old, although very small, it has a much better chance to live, no matter what the weight. The very fact of having survived a week with so small a body augurs a very good constitution, and with proper care there is every likelihood that the baby can survive.

One case may be related as typical of the susceptibility to infections.

Baby J. L. weighed at ten days 2 pounds, 3 ounces, seven months' gestation, and was 43 cm. long. At first fed on breast milk one-half strength; later three-fourths breast milk and one-fourth whey, 177 calories, when eight feedings of  $1\frac{1}{2}$  ounces were given. It gained well on this to 3 pounds, 14 ounces. It then lost 1 ounce; then the food was peptonized and potassium citrate added. It gained to 4 pounds, 1 ounce, when it was put on whole milk 7 in 20 with 1 ounce dextrimaltose, seven feedings of  $2\frac{1}{2}$  ounces. On this the baby gained up to 4 pounds,  $13\frac{1}{2}$  ounces. Then it suffered gonococcus infection and had to be removed from the premature ward for isolation. The infection and the less expert care caused the baby to lose rapidly and it died, weighing 4 pounds, 4 ounces.

TABLE II.

PREMATURE INFANTS IN BELLEVUE HOSPITAL, JUNE, 1915,  
SHOWING RELATION OF WEIGHT TO LENGTH

	Name	Gestation Period, Mo.	Weight,		Length, Cm.	Length, Inches
			Lb.	Oz.		
1.	T. ....	..	3	$4\frac{1}{2}$	39	$15\frac{1}{2}$
2.	J. T. ....	..	3	2	40.5	16
3.	D. C. ....	..	4	$4\frac{1}{2}$	42	$16\frac{3}{4}$
4.	J. S. ....	..	5	..	48	19

	Name	Gestation Period, Mo.	Weight, Lb. Oz.	Length, Cm.	Length, Inches
5.	M. A. ....	..	4 8½	47	18½
6.	D. A. ....	..	4 3	43	17
7.	L. F. ....	..	4 13	45.5	18
8.	T. R. M. ....	..	4 13	47	18½
9.	N. B. ....	..	4 1	47	18½
10.	P. ....	..	4 10	47	18½
11.	C. S. ....	..	3 11	44.25	17½
12.	M. V. ....	..	4 3	48	19
13.	B. ....	6	2 12	38	15
14.	P. ....	7	2 2½	36	14¼
15.	S. C. ....	..	4 2	43	16¾
16.	F. H. ....	..	2 13	37.5	43¾
17.	M. V. ....	6	1 12	33.5	13¼
18.	E. ....	7	2 5½	35	14
19.	C. ....	7	2 15½	38.5	15½
20.	A. U. ....	..	2 5½	35	14
21.	No. 767 ....	..	2 13	..	16½
22.	No. 766 ....	..	3 4	30 (?)	..
23.	No. 263 ....	..	2 16	34	..

TABLE III.

## DATA OF INFANTS CURED

First Weight, Lb. Oz.	Length, Cm.	Discharge Weight, Lb. Oz.	Time in Hospital, Mo.	Food
4 6	33	5 1	3	At first took breast milk ¼, barley water ¼. Later 6% 5 in 20 with 1 ounce dextrimaltose.
3 ..	43	5 5	4	First food breast milk and whey 2/3 to ¾ strength. Later in conjunction with or entirely 6% 5 in 20, with 1 ounce dextrimaltose.
4 2	..	6 6	4	Breast milk gradually changed to top milk-modification.
2 13½	..	5 6½	7	One-half strength breast milk alternated with 6% 5 in 20. Later whole milk 7, dextrimaltose 1½, barley water to 2½, with the addition of ½ yolk of egg twice daily. ¾ ounces, 7 feedings.
4 10	..	5 4	1¼	Breast milk gradually changed to top milk-modification.
3 14	..	5 1	3½	Breast milk and whey, gradually changed to alternation with modified milk; calories 89 to 160. Did best on 140 calories.
3 15	..	4 14	1½	Calories 100 to 150.
3 14	..	6 2	2½	Breast milk gradually changed to top milk-modification.
3 13	..	4 11	1½	Baby had bronchopneumonia with temperature up to 104°; did best on about 170 calories; took no breast milk; had either modified 6% milk or modified whole milk.
4 5	..	4 6½	1 week	Breast milk gradually changed to top milk-modification.
4 ..	..	5 13½	2	At first 6% milk ¾, milk sugar ¾ and barley water to 16, 2, 8 feedings, 119 calories. Next 6% milk 4½, 2 ounces, 8 feedings, 160 calories. Gained on this to 4 pounds 10½ ounces. Next 7% milk 5 ounces, milk sugar ¾ to 1, barley water up to 20, 125 calories. Gained on this to 5 pounds, 4 ounces.
4 2	..	5 1	2	Breast milk gradually changed to top milk-modification.
4 12	..	5 9	¾	7% milk 5, dextrimaltose 1, Granum water to 20, 2½ ounces, 8 feedings, or 125 calories. Food never changed.
3 11	..	4 15	2	Never took any breast milk, but 6% 5 in 20 with dextrimaltose 1 ounce, quantity being increased from 1 to 2 ounces, 8 feedings.

## COMMUNICABILITY OF POLIOMYELITIS

BY CHARLES G. KERLEY, M.D.

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Text-books published previous to the present year make no mention of the communicability of poliomyelitis. Previous to 1907 the disease in this country occurred in small groups or isolated cases in various sections of the country. The epidemic of 1907, which visited New York and the surrounding country, comprising a radius from 50 to 100 miles, was the first serious epidemic in this country. At that time there were, according to La Fétra, over 2,500 cases diagnosed as poliomyelitis. That many cases were not diagnosed there is not the slightest doubt. No attention was paid to the possibilities of contagion or communicability. In no hospital or home was the disease quarantined. Cases were admitted freely to the general wards, and in no instance did a case develop in exposed unprotected children in any hospital ward in this city. Later epidemics in this and other countries tended to strengthen the opinion, rapidly gaining adherents, that poliomyelitis belonged to the transmissible diseases. The transference of the disease from human to monkey through a series of monkeys by Flexner and others is now medical history.

1. Is the disease transmissible by the diseased to the unprotected individual by the ordinary means of human contact?
2. What part may the innocent play in the transmission of the disease?
3. What proportion of healthy children are susceptible?

Epidemics of any nature among the masses in a large city offer but little opportunity for observation relating to the epidemiology of disease from the standpoint of human contact. There is a class of children, however, in large cities from whom most valuable information may be drawn. I refer to the permanent inmates of children's homes. I am indebted to our Health Commissioner, Dr. Haven Emerson, for the following most instructive study.

There were no cases of poliomyelitis on Governor's Island at any time during the past summer or fall. The officers on the Island established and maintained throughout the epidemic a strict quarantine, applying to children under sixteen. There are about eighty children on the Island.

The Department of Health has under its jurisdiction ninety-three institutions for the permanent care of children, with a population of 21,746, and seventy-six of these institutions provided temporary care, such as summer camps, day nurseries, etc., with a population of 3,665 children.

Two cases of poliomyelitis developed at Sea Breeze, one of the homes for temporary care of children; one in a child one day after admission, and one in a child five days after admission, direct from tenement homes.

Five cases developed at the Foundling Hospital, one of the institutions for the permanent care of children. The first case (A) was brought to the hospital by a foster mother, with the disease already developed. The second case (B) developed the disease seven days after admission to the institution, direct from a tenement home. The third case (C) was in the bed next to (B) and developed the disease nine days after the admission of the second case. The fourth case (D) developed while (B) was in the hospital, although in another ward. The fifth case (E) had been in the institution many weeks, and so far as is known had no relation with any carrier or case from without.

The Home for Destitute Children, in Brooklyn, was quarantined on July 14th, and three cases developed on July 18th, 21st and 24th, respectively. All of these children had, however, been allowed to go out in Prospect Park with other children, where they were exposed to contact.

One case developed in the Angel Guardian Home on July 27th, after quarantine was established on July 14th.

One case developed in the Sheltering Arms Nursery on July 21st, the day quarantine was established.

One case developed in St. Joseph's Home, Flushing, in a four-year-old child, who had been in the institution for two years. The onset of this case thirty-five days after quarantine had been established was on the same day as that of the engineer's child, who lived in the adjacent house. The thoroughness of the quarantine was not all that was required in the Department Hospitals.

One case occurred on August 23d, at St. Joseph's Home, Huguenot, S. I., this child being one of ninety-seven children who had been quarantined since July 4th. The diagnosis in this case was never fully confirmed. The child was unconscious for eight weeks and died without laboratory or clinical confirmation of the diagnosis and with the autopsy results wholly unsatisfactory.



There were no cases on Barren Island, where there were three hundred and fifty children in a population of fifteen hundred people. Nothing but the geographical and social isolation of this community can be considered responsible for its immunity to infection.

It will be seen from the foregoing that among 21,746 children in ninety-three institutions under permanent jurisdiction of the Health Department but ten proved cases developed in the various institutions. Three of these developed in less than two weeks after admission; three others were allowed to mingle with city children in a public park. This low morbidity is to be ascribed to the strict quarantine established in the various children's institutions by the Department of Health. There were no cases on Governor's Island or Barren Island, localities isolated and quarantined.

Early during the past summer, when the disease developed in Brooklyn and spread rapidly to Manhattan and the suburbs, it was a safe conclusion that it would spread along the lines of human travel to isolated sections. It occurred to me that I could occupy myself to good advantage by investigating thoroughly every first case that occurred in any isolated community near my summer home in northwestern Connecticut.

In this report only the localities are included in which the disease had not been known to exist for a period of ten years.

CASE I. The first case to come under observation developed in a Connecticut village of about 1,500 inhabitants. A native girl, four years old, developed a severe polioencephalitis and died in five days. This child had not been out of the village for three months. The usual speculation as to the origin of the infection was freely indulged in by physicians and laymen. Ten days before she fell ill a family from a New York suburb took residence in the village, about 500 feet from the home of the child who died. Two children in the family, aged three and six years, became ill the day after their arrival. They had elevation of the temperature and gastrointestinal disturbances. The six-year-old girl was ill but a day and then circulated freely with other children in the neighborhood. The three-year-old girl was kept to her room after the first day or two because of protracted digestive disturbance. Two weeks after the onset of their illness I examined the children. The three-year-old girl showed a left



facial paralysis and a loss of knee-jerk of the left leg, with a slight weakening of the leg. Both children had been in contact with the native child and they both had poliomyelitis, which had not been recognized. The older child mixed freely with other children on the street and in the country-house yards. The period of incubation in the fatal case was less than ten days.

Infection by direct contact.

CASE 2. Two weeks after the death of the native child, a colored child, eleven years of age, living in an isolated section, two miles distant, developed polioencephalitis and died in four days. This child had been on the street in the locality of the infected children at the time they were at large.

These two fatal cases, other than the two mentioned, were the only native or visiting children who developed poliomyelitis. All, however, were in association with at least thirty other children. The colored girl passed the four days of illness cared for by six brothers and sisters, from six to eighteen years of age, who all remained well. The four-year-old girl who died had a brother of eight, who was freely exposed, and two of the neighbor's children took an automobile ride with her the first day of illness, when her temperature was 102°F. The period of incubation was at least two weeks.

Infection by direct contact.

CASE 3. A girl, eight years of age, living in an isolated farmhouse, developed poliomyelitis, with paralysis of both arms. Three weeks before becoming ill a family from Brooklyn, with two children under six years of age, took up summer residence about half a mile from the home of the native child's, and came in association with her. The Health Officer from the town and an official from the State Health Department visited the Brooklyn family and could get no history of exposure or evidence of disease in the visiting children. There were no other cases in that township during the summer or fall.

Infection by innocent carrier.

CASE 4. A child, eighteen months of age, living in an isolated farmhouse, developed poliomyelitis, with paralysis of one leg, early in August. She had never been away from the farm. Four weeks before a family with three children under six years of age (none of whom had been ill) from a New York suburb took resi-

dence in a farmhouse about a quarter mile distant from the patient. They came into immediate contact with the patient. There were no other cases in that section. The visiting family denied illness or exposure to poliomyelitis.

Infection by innocent carrier.

CASE 5. A young woman, twenty-seven years of age, a resident of a mountainous district in Eastern New York, visited a Hudson River village where there had been several cases of poliomyelitis, but did not come in contact with a sick child. Two weeks after her arrival home she developed poliomyelitis, with paralysis of both legs. There were no other cases in that section.

Infection by innocent carrier.

CASE 6. A three-year-old girl, a resident of a village in New York State of perhaps 2,000 people, developed infantile paralysis, with fever and sore throat. There was resulting loss of knee-jerks and slight paralysis of the left leg. While ill she was visited by a neighbor's girl, fourteen years of age, who developed polioencephalitis in seven days and died on the third day of illness.

In the family of the three-year-old child a woman from Brooklyn had been entertained, who was said to have lost a child with infantile paralysis. This I could not later confirm, nor was it denied. All information relating to the visitor was refused by the family. Further cases developed in the locality, but none in the family of the first case. There were seven children in the family and no quarantine was observed.

Infection by innocent carrier.

CASE 7. A baby of eighteen months, a resident of a small village in Connecticut, developed a paralysis of the muscles of the left eye, with evident diplopia, with complete recovery in four weeks. Three weeks previous a woman with a four-year-old child from New York had taken residence with the family. The visiting child was entirely well and gave no history of illness. There were other children in the family, who remained well, and there were no further cases in this section.

Infection by innocent carrier.

CASE 8. A boy, nine years of age, a resident on a country estate, developed polioencephalitis. There had been no association with other children other than a brother and sister for weeks

previous to illness. The boy's tutor lived in an infected locality and visited the boy daily.

Infection by innocent carrier.

CASE 9. A boy, ten years of age, visited a small summer resort where there were a large number of children. The day after his arrival he fell ill with polioencephalitis, with diplopia and loss of knee-jerk. The disease was recognized at once and a rigid quarantine established. No other case developed in that community.

CASE 10. A boy, eight years of age, a resident of a village of 3,000 inhabitants in Southern Massachusetts, developed a mild poliomyelitis. His was the first and only case in the village. He had attended school and church.

Infection by innocent carrier.

CASE 11. Two children, brother and sister, living in an eastern Connecticut village of 2,000 people, developed poliomyelitis almost simultaneously. Quarantine had been in operation for four or five weeks, no children being allowed to go from or come to the village.

Infection by innocent carrier.

*Conclusions*—But little comment is required. Every man may draw his own conclusions. The following seem reasonable:

1. That poliomyelitis may be communicated through personal contact.
2. That there are innocent carriers who spread poliomyelitis.
3. That but a small percentage of children are susceptible to poliomyelitis. Schick has shown, in the use of the test bearing his name, that among 747 children under fifteen years of age but 34.9 per cent. were susceptible to diphtheria. The susceptibility of children to poliomyelitis is much less than the susceptibility to diphtheria. Probably from 90 to 95 per cent. possess an immunity.

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# OBSERVATIONS ON MEASLES \*

BY CHARLES HERRMAN, M.D.

New York

The deaths reported as due to measles give a very inadequate and incorrect idea of the real number due to this disease, for it is well known that most of the deaths are not due to the original disease, but to a complicating bronchopneumonia, and many physicians who have failed to report the original disease do not mention it on the death certificate. Most of these deaths occur in patients between 1 and 2 years of age. Chart 1 shows the curve

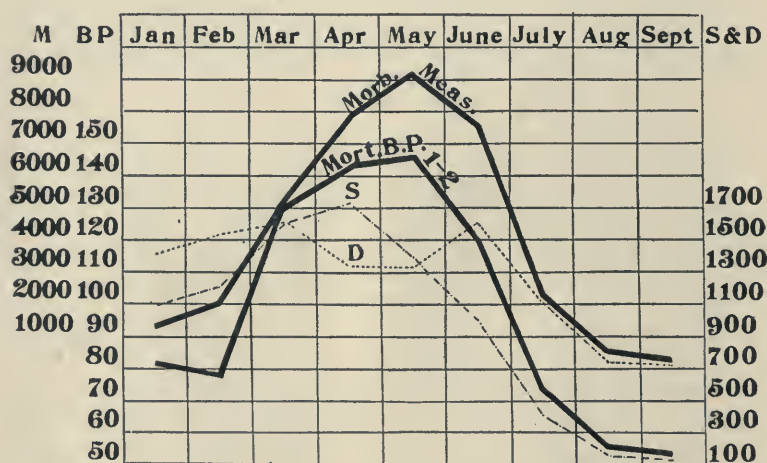


CHART 1. New York City, 1915. Showing the parallelism between the curves of morbidity from measles and mortality from broncho-pneumonia between 1 and 2 years of age. The curves of morbidity from diphtheria, D, and scarlet fever, S, do not show this parallelism

of morbidity from measles in New York City during 1915, and the curve of mortality from bronchopneumonia in children between 1 and 2 years during the same time. It will be seen that these curves run nearly parallel, which, although not conclusive, is at least suggestive. It may be objected that the curves of other communicable diseases would show the same parallelism; I have therefore added those of scarlet fever and diphtheria. It will be noted that they do not show the sudden rise and fall.

However, measles is an important disease, not only on account of its complications and deaths, but also because it probably offers

\* Read at the Twenty-elghth Annual Meeting of the American Pediatric Society, held at Washington, D. C., on May 8, 9 and 10, 1916.



the best opportunity for studying the problems of infection, incubation and immunity. The infection takes place with such certainty, the duration of the period of incubation is so uniform, and immunity is conferred so regularly. As it is a very common disease, in epidemics one often has an opportunity of studying a very large number of cases.

In the short time at my disposal I shall discuss briefly a few observations more or less disconnected. Table I is based on a

Day	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Fever	4.	6.3	13	33	23	7.6	6.3	4.3	1.	.6				
Catarrh	.4	.7	4.7	14	34	26	9.8	5.	1.5	2.5	1.1		.3	.3
Ton.sp.	4		14	16	25	22	18							
Koplik			2.8	10	28	26	18	7.4	2.3	2.8	.9		.5	.5
Erupt.				1.5	6.	18	29	20	13	6.	3.5	1.5	.3	.3

TABLE 1. Based on 300 secondary cases of measles. Showing number of days that elapsed between the time of infection and the appearance of fever, catarrh, tonsillar manifestations, Koplik spots, and the eruption. Given in percentages of cases

series of 300 secondary cases and shows the number of days that elapsed between the time of infection and the appearance of fever, catarrh, tonsillar spots, Koplik spots, and the eruption. For the sake of simplicity the numbers have been reduced to percentages. It will be seen that fever was the earliest symptom and appeared most frequently on the tenth or eleventh day (56 per cent.), the catarrhal manifestations most frequently on the eleventh or twelfth day (60 per cent.), the tonsillar spots appeared with nearly equal frequency on the ninth, tenth, eleventh, twelfth and thirteenth day, the Koplik spots were most frequently seen on the eleventh and twelfth day (54 per cent.), and the eruption appeared most frequently on the twelfth, thirteenth or fourteenth day (67 per cent.). The catarrh was present in 7.2 per cent. on or before the tenth day, the Koplik spots in 12.3 per cent. and the tonsillar spots in 34 per cent. The tonsillar spots have been seen more regularly in the more recent cases, probably because they were looked for earlier. It will be noted that in 4 per cent. of the cases in which they were present they were seen as

early as the seventh day, at a time when there was nothing but a slight rise of temperature to indicate that the child was not well. In a few cases the tonsillar spots were present in patients who did not show any Koplik spots. Although their presence is not absolutely pathognomonic, their value is very great in hospitals, asylums and schools, because it makes it possible to detect and isolate secondary cases early.

Infants under 2 months of age are absolutely immune. As they grow older this immunity becomes less absolute, so that at eight months it is apparently entirely lost. This gradual disappearance can be demonstrated in various ways. Table 2 shows the number

Day Erupt.	10	11	12	13	14	15	16	17	18	19	20	21
Over 8mos	1.5	6.3	20	31	23	11	4	2.2	.7	.7		
Under ..		4.7	9.5	22	6.3	24	14	9.5	4.7	1.6	1.6	1.6

TABLE 2. Showing the number of days that elapsed between the time of infection and the appearance of the eruption in the patients under as compared with those over 8 months of age. Given in percentages of cases

of days which elapsed from the time of infection to the appearance of the eruption. Of the 300 patients, sixty-three were under 8 months. Of these none were under 4 months and only four were under 5 months. It will be seen that in 81.4 per cent. of those over 8 months the eruption appeared on or before the fourteenth day, whereas in only 42.5 per cent. of those under 8 months did it appear at that time. This prolonged incubation period would tend to indicate a relative immunity in infants under 8 months. The same is indicated in another way. In infants between 5 and 8 months of age the disease is usually milder and the appetite is not entirely lost. I was able to obtain the weights of 59 patients under 2 years at the time of exposure to infection and at the onset of the disease. Of these seventeen were under 8 months and forty-two were between 8 months and 2 years. Of the young infants only seven (41 per cent.) showed a loss in weight, whereas of the older children thirty-two (76 per cent.) lost in weight.

The immunity enjoyed by young infants is not conveyed through the breast milk, for I have found that artificially fed infants are also immune. It seems most likely that it is conveyed through the placental circulation, and this would account for its

gradual disappearance. It is also an interesting fact that only in places in which measles is endemic do the infants enjoy such immunity. For example, in New York City practically every child is exposed to the infection at home or in school before it reaches the age of 10, so that it is exceedingly rare to find a mother who has not had measles. On the other hand, in certain isolated islands of the Pacific Ocean the disease breaks out only at long intervals, so that it is possible for a mother to have children, without having herself been exposed to infection. These children are not immune. This difference in the prevalence of the disease in different localities may possibly account for the apparent differences of opinion among authors as to the frequency of measles in children under 5 months of age.

It is an interesting fact that when infants between 3 and 5 months of age are exposed to infection and do not contract the disease, they *frequently* are not infected when exposed to the

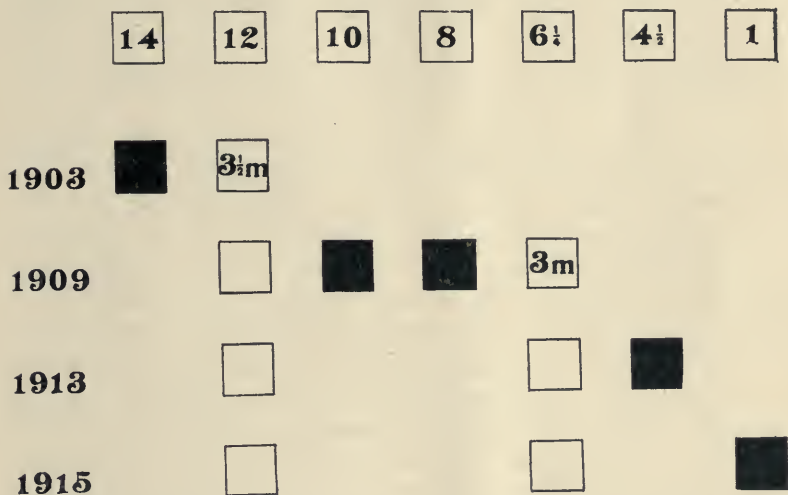


CHART 2. A family of 7 children. Illustrating that infants who are *intimately* exposed to measles infection between the age of 3 and 5 months and do not contract the disease, are frequently not infected when exposed to it in later life

disease in later life. Such contact must be *intimate*. In well-to-do families in which the infant has a separate nurse this may not occur. The accidental inoculation must take place *after the third month*, because before that time, immunity being absolute, there is no reaction and no immunity is conferred. I have records of a number of cases, but the family illustrated on Chart 2 is the most

striking. There were seven children, aged 14, 12, 10, 8,  $6\frac{1}{4}$  and  $4\frac{1}{2}$  years, and the youngest 10 months. The oldest child had measles in 1903; the second child was  $3\frac{1}{2}$  months old at the time and did not contract the disease. The third and fourth child had measles in 1909; the second, though exposed, did not contract it; neither did the fifth child, who was then 3 months of age. The sixth child had measles in 1913, and again the second and fifth were not infected. The seventh and youngest child had measles in 1915, and again the second and the fifth remained free.

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ANTEVERSION OF THE NECK OF THE FEMUR—Study of failures in the treatment of congenital dislocation of the hip has convinced R. A. Hibbs (*Journal of American Medical Association*, 1915, Vol. LXV., p. 1801) that some of these were due to anteversion deformity of the head and neck of the femur which was not recognized before operation. There is a certain amount of anteversion in the normal femur, but probably not more than from  $10^{\circ}$  to  $15^{\circ}$ . More than this amount is abnormal, and certainly when it is as much as from  $75^{\circ}$  to  $90^{\circ}$ , grossly so. With the leg straight and the toe and patella pointing forward in the normal direction, the head of the femur cannot be completely in the acetabulum. With the head thus partially engaged in the socket, weight bearing is uncertain and there is always a limp. To treat the matter as a twist of the shaft of the femur, and correct it by osteotomy before any attempt is made to reduce the dislocation has been done in a series of 29 hips in 26 children, all the patients having been previously operated on for dislocation once and in some instances twice, with failure. It is done by an osteotomy at the lower third of the femur. After the bone is divided, the lower fragment is twisted outward to the degree that the head is abnormally anteverted. After the bone unites, the patient is allowed to walk from eight to ten weeks until the external rotation of the leg is corrected by exercises and it takes the normal position in walking, the patella and toe pointing forward. At this point in the treatment the dislocation should be reduced.—*American Journal of Obstetrics.*



## THE COUNTRY CARE OF THE CARDIAC CHILD: WHAT MAY BE ACCOMPLISHED \*

BY HERBERT B. WILCOX, M.D.

New York

There is small provision made to-day for the country care and fresh-air treatment of the really sick child. This is a pity, because that vague classification includes just those children who need such opportunity the *most*, and many who will produce the most striking and spectacular results if given it.

There are 109 institutions in New York City and the neighboring districts offering fresh-air care for children. Seventy-nine of these do not take sick children, but accomplish a most useful work in offering recreation to the poor, who otherwise would never see anything but concrete pavements, and add greatly to the composite health of the city by the individual benefit given.

For such institutions, however, the bed-ridden child in need of medical attendance and trained nursing, or the child who is likely to die, is *not* an acceptable candidate.

Twenty-eight institutions accept children convalescent from acute disease, but stipulate that they must be fairly able to take care of themselves. Here again the seriously sick case is barred.

There are only six institutions which give preference to children sick with serious chronic or acute conditions, and in need of medical treatment and nursing, plus the equally important factor, ideal hygiene and open-air treatment.

Every physician who has to do with the hospital care of children soon realizes that there is needed all too frequently something more than the facilities of his ward; that is, rest, food and medical attendance, on the one hand to *cure* many cases, and on the other hand, to make such cures as *are* effected in the ward, 100 per cent. in completeness and permanency.

It is truly and often said that a hospital is no place for a feeding case, once the immediate causes of the digestive derangement have been identified and corrected.

Vomiting and diarrhea can be stopped, intoxications and acidoses can be recognized and proper measures for their treat-

\* Read at the New York Academy of Medicine, Section on Pediatrics, December 14, 1916.

ment instituted, but most of these babies will not go on to progressive gain in weight, health and strength so long as they are confined to the ward.

This is even more true of children suffering from organic disease of the heart, as their period of treatment is naturally much longer, and the chances of hospitalization correspondingly greater.

More than in other conditions it is important, too, that something further than the alleviation of the acute symptoms of cardiac disease be done and done early, if *progressive* involvement and damage to the heart is to be avoided.

Every cardiac lesion is potentially serious, but *many* may be completely arrested and cured if given prolonged and proper care; *certain more serious* lesions of long standing can be stopped short of complete incapacity only if given every opportunity to conserve the remaining functional capacity.

The result of inadequate provision for the proper handling of this class of children represents such suffering to the individual, and expense to the State in their later care, as to give the subject under discussion the greatest philanthropic and practical importance.

Many children are discharged from the ward cured of the most apparent effects of their anemia, rheumatism, pneumonia, typhoid and what we are particularly concerned with here, their cardiac affections, to return to their homes and the very conditions which were responsible for their illness, in no way fortified against a repetition of their physical misfortunes.

Looked at in this light, the effort expended upon them while in hospital was not an economical one, in that the results are too often only temporary.

The treatment of the acute stage of any disease properly belongs to, and is best handled in, the hospital ward, but the outcome of many a slow convalescence from the chronic types of disease would be fortunate more often, and shorter in all, if sunlight and fresh air could be added to the general hospital care.

The bed case eking out a tedious and uncertain convalescence, and the hopelessly crippled chronic, deserve an equal share of the out-of-doors opportunity with the usual somewhat anemic, but generally healthy, inmate of the fresh-air home.

Four years ago we attempted to make the work of our ward and Out-Patient Department at Bellevue more permanently and

economically efficient by starting at Fairfield, Conn., what we called the Auxiliary to the Children's Service.

We established there a small hospital of eighteen beds, in charge of one of our nurses, and visited regularly by the members of the attending and house staffs. The routine medical care as carried out at Bellevue was continued at Fairfield, with the *addition* of fresh air, sunshine and unlimited space. After two years' experience at Fairfield the Home was moved to Rahway, N. J., where a larger plant and better equipment was available. With the exception of last year, when the epidemic forced us to close at the end of August, the work was carried on from May until the middle of October.

Most important to the success of such a plan of treatment is first, the consecutive activity and constant coöperation of the Out-Patient Department and ward in *selecting* and *preparing* for transfer to the home the most suitable material; second, the continuance of the same medical supervision at the home as had obtained before transfer, and, third, the return to out-patient or ward service of all cases for observation or care after release from the home, and their further supervision by the visiting nurses of the Social Service Department to assure the carrying out of instructions given on discharge.

The record of a case followed through these stages gives complete data as to the need for, and results of, such a plan of treatment. Good results should be obtained in cases chosen with the thorough knowledge of their therapeutic possibilities gained in the ward, and the increased chances of intelligent coöperation on the part of the parents under the direction of the nurses engaged in following up.

One case will illustrate this: A boy of seven years had been unable to lie down for some months because of cardiac dyspnea. On his admission to Bellevue he presented a double mitral lesion, pleuritic effusion, enlarged spleen and liver and marked general edema. He was anemic and emaciated. He improved very slowly at the hospital, and was finally transferred, with considerable misgiving on our part as to how he would stand the journey, to Fairfield. He spent 104 days there, at the end of which time his color was good, he had gained 8 pounds, and was able to be up all day without cardiac embarrassment. Three months later in New York City he showed no tendency to relapse, and was reported to be well at the end of a year, when he was last heard

from. Forty days in the Bellevue ward had relieved him of some of his edema; 104 days in the country put him on his feet and kept him there for fourteen months.

A short history and physical examination sheet, stating the condition on admission to the hospital and on transfer to the Home, accompanied each patient. To this was added the observations made at the Home, and a description of the child's condition on discharge. On arrival the children were weighed, put to bed, and kept there until it was determined just what freedom their cardiac condition would allow; the amount of exercise was increased gradually, or reduced, according to indications. They were kept exposed naked to the sunlight as much as weather and the condition of their skins would allow. Insolation, rest and nourishment constituted all the treatment given.

The qualifications which determined our selection of cases for the country branch was, in general, that the children should be too sick to be acceptable to the usual fresh-air home, or preferably so sick that recovery was doubtful, unless some curative factor in addition to general hospital care could be brought to bear on their treatment.

We include in this group marasmic infants, cardiac disease, chorea, chronic pulmonary diseases including tuberculosis and late pertussis, anemia and malnutrition.

Our experience with the marantic infant was short lived, as it was found impractical to group and care for these young babies in the same wards with the older children.

We were glad also to take incurable cases who seemed to us to *particularly* deserve out-door opportunity, even when seemingly sure to terminate fatally while under our care at the home. In these instances, although no therapeutic results were obtained, the remaining days were certainly made happier there than they could have been within the four walls of a hospital ward.

Our children were not limited as to the duration of their stay, as it seemed more desirable to give the maximum benefit to a few selected cases than to treat less thoroughly a larger number. It has become apparent that a month is the minimum time in which any actual improvement can be expected.

Up to the present we have cared for 191 children suffering from a variety of diseases; 77 of them were cardiac cases.

Eighty-four hundred days of hospital care have been provided; the average stay of each child in the Home was forty-two



days; the shortest eleven days; the longest one hundred and forty.

The conditions treated in these four years include—

Cardiac .....	77
Chorea .....	83
Pulmonary disease (unresolved pneumonia, pleurisy, empyema, closed tuberculosis)...	64
Malnutrition .....	28
Anemia (alone or complicating chorea or endocarditis) .....	100
Convalescence from diseases other than those mentioned .....	18
Rheumatism .....	23

It is interesting to compare the results obtained on the cardiac cases with those of the children suffering from other conditions which are generally considered more amenable to cure.

#### COMPARISON OF RESULTS IN TREATMENT OF GENERAL AND CARDIAC CASES

NUMBER	CURED	IMPROVED	CURED AND IMPROVED	UNIMPROVED	WEIGHT GAINED
CARDIACS 77	49%	40%	89%	11%	2½ LBS.
GENERAL 114	64%	27%	91%	9%	3 LBS.



It is to be remembered that the worst cardiacs were given preference in our choice of cases, all had myocardial, endocardial, or pericardial lesions, and were, or had recently been, suffering from decompensation of varying degree.

Forty-nine per cent. of the children who came to us seriously incapacitated by their cardiac condition were discharged without any remaining *surface* evidences of the disease, and able to follow a nearly normal life. Sixty-four per cent. of the non-cardiac group were discharged cured.

Forty per cent. of the cardiacs were improved in general, but still disabled on their discharge. Of the non-cardiacs, 27 per cent. were discharged as practically cured or improved.

Eleven per cent. of the cardiacs were discharged unimproved or died, while 9 per cent. of the non-cardiacs were discharged unimproved or died.

The average gain in weight among the cardiacs was 2½ pounds; among the non-cardiacs 3 pounds.

In other words, our cardiacs responded about as readily to treatment as did the average run of diseases, and it seems that this success hinged upon *just one* easily treatable factor in their condition.

It is not possible to replace the connective tissue of the diseased heart wall with normal cardiac muscle, nor to remove the actual damage done to the valves. There is, however, one basic condition common to almost all chronic cardiacs, which so long as it persists prevents proper nourishment of the heart, and stands in the way of definite improvement; this is anemia, and anemia for its proper treatment demands sunlight and fresh air.

Our experience with one group of 15 cardiacs treated during the summer of 1914 was particularly satisfactory, and yet fairly illustrative of the whole four years' results.

On October 23d, 15 children returned to the dispensary for inspection, about six weeks after dismissal from the Home. All of them on leaving the hospital for the country were seriously incapacitated by their disease, all were anemic or undernourished, some in a marked state of malnutrition, many showed the more serious evidences of cardiac failure, and the majority of them were sent out as bed patients, being carried to the train or boat and having to remain in bed for the first portion of their stay in the country, and yet at the time of this inspection there was no child among them who in general appearance showed evidences of his cardiac disease; the nutrition was good, color excellent, and the children appeared in good physical condition.

It is a potent argument for the value of such out-door care that upon this fall inspection these children all walked to the dispensary, and seemed in better condition on superficial examina-

tion than the majority of applicants who were that day appearing for general treatment. Most of them had returned to school. Many during the six weeks since their return had been climbing without bad effects, two to five flights of stairs on going to and from their homes. In the case of some it was necessary to make arrangements with the families to avoid this unnecessary strain of stair-climbing. In other instances it seemed desirable to give the children further rest at their homes, and to take them out of school, but in only three instances was the heart condition found on examination to be bad enough to warrant their return to the hospital ward.

Fifteen children too sick with heart disease to remain on their feet applied for ward treatment in the spring. They remained in the ward until their condition warranted a transfer to the country. As a result of their country experience they returned to New York City in every instance in excellent general condition, showing no outward evidences of circulatory disturbance. They took up their New York City life, with its many flights of stairs both at home and at school, too often with insufficient nourishment, and usually under poor hygienic conditions, and at the end of those weeks presented themselves at the dispensary in better condition than the average applicant with whom they mingled.

These facts seem to make it clear that we may expect to do quite as much with the child with a broken-down heart as we can do with those suffering from ills of a less vital nature, and yet the provision for caring for these children is *one-seventeenth* that offered to other classes of disease.

The cost of carrying out such work, including all expenses, such as salaries, provisions, clothing, medical supplies and transportation to and from the home was \$8,456, or an average of \$1 per child per day.

The staff required consisted of a head nurse or matron, in charge of all administrative work, purchasing and housekeeping, and also responsible for the medical care and nursing of the children, assisted by two trained nurses, and an untrained ward helper. The domestic staff was made up of cook, laundress, maid and useful man. This represents a relatively large amount of help, but it was found to be necessary because of the fact that our children were almost all bed cases, and demanded the same amount of routine care that they would have received in a hospital ward.

39 East Seventy-Fifth Street.

## OCULAR WORK AND REST IN CHILDHOOD\*

BY COLMAN W. CUTLER, M.D.

New York

It may well seem bold to offer a paper not based on data, containing no narration of cases or of results, and dealing with matter essentially commonplace, especially at this time when the medical mind is fed with stronger meat and when large problems are ripe for solution, but, after all, the affairs of daily life are important and we may overlook conditions of much interest if they are not studied with an attentive eye. I shall therefore make no excuse, but shall speak of children's eyes in relation to their work, with especial reference to certain tendencies, the early recognition of which is vital to normal development.

The eye at birth is undeveloped. It is scantily supplied with the pigment which is so important a protector against light. This is obvious in the blue iris. The unwinking eye of a child may show also a lower sensitiveness. The rods, and especially the cones in the macula, are imperfect at birth, and they may not reach full development for weeks or months.

The infant begins to work very early. With the first gleam of consciousness he envisages his world, and it should be a quiet world—he will get little of that later. His eyes though unprepared are active functionally from the first day. There is no attempt at focussing or fusion, but in a few weeks most infants direct both eyes at an object normally, although the associated functions of accommodation and convergence are far from perfect.

In some children the effort to see small objects clearly leads to an undue effort of accommodation. They bring the toy or picture so near the eyes that convergence is either impossible and one eye diverges, or, as is more frequent, the effort of the ciliary muscle—the more delicate mechanism—induces an overexertion of convergence, the coarser, and one eye turns in. Both acts are under the control of the third nerve, and one reinforces the other, but at this age the macular or central fixation is not sufficiently developed to hold the eyes straight, therefore one eye squints.

\* Read before the Hospital Graduates' Club, October 26, 1916.



This act of binocular fusion is of great interest: As you know, the visual elements of the retina are the rods and cones. If we accept the duplex theory of Parinaud and Von Kries, the rods have to do with light and color chiefly, the cones with form. Now the rods and cones are both present in the whole retina except in the central portion, the fovea, where there are only cones, more numerous and more richly supplied with nerve fibers than elsewhere, and where, consequently, vision of details is most acute. This central area may be called the observing or studying eye, while the periphery is the discovering eye. Thus, an object enters the field of vision and is seen in its larger contour and colors, and the eye is turned at once towards it, so that its details may be studied by the macula.

Claude Worth, in his excellent book on "Squint," calls the impulse to direct both eyes on an object the fusion faculty. This is in two parts—first, the superimposing of the image of one eye on the other, and, second, the mental perception of depth, or stereoscopic vision. The first is made possible by the predominance of the macula and by the law of identical points. The second, the sensation of depth, is not so simple. It is probably a mental acquisition, the result of experience aided by the habit of touching, feeling and reaching for objects. It is uncertain how early it develops, but the lack of it, as well as the imperfect development of the macula, accounts for the brief wanderings of the infant's eyes, or pseudo-squint (Worth).

If by some fault in the relation of accommodation and convergence, or through an inequality in the structure or vision of the two eyes, this fusion is interfered with in its first part, that is, if the two images are not superimposed the second part, or stereoscopic vision, is delayed or remains undeveloped and the eyes lose their strongest impulse to binocular vision. If, partly as a result of this defect, one eye tends to converge, diplopia results and the suppression of the image received by the squinting eye inevitably follows.

We find these amblyopic eyes too frequently, through the neglect of parents or their advisers to recognize the significance of moderate squint, often not constant, which may indeed disappear with growth, but which leaves, if it is unilateral, a permanently defective eye. It is often possible to avert this unfortunate result by the use of atropin in the fixing eye, but this is

successful only at a very early stage. Careful correction of refractive errors at a very early age, the development of fusion by training with Worth's amblyoscope, and especially the avoidance of small objects and of continuous work or play at short range, are, briefly, the measures indicated. This kind of squint is at first a function of nervous activity or excitement and may indeed disappear during rest and relaxation, but if incipient squint is neglected it is probable that the squinting eye will remain defective and that an operation will be needed later to correct the disfigurement—an operation which is at best an artificial makeshift as compared with the natural process under the control of binocular fusion and is attended with considerable uncertainty as to its results.

In this brief résumé I do not allude to congenital amblyopia due to organic defects of the retina or to birth injuries, or to the congenital paralyses with secondary contractures of the ocular muscles, which have been so well described by Dr. Duane. The subject is large and of general interest and I would refer you to Worth's book on Squint for statistics and conclusions based on a large number of cases.

Nervous children react too promptly to stimuli of all kinds. Often the reaction is brief and superficial, but it is tiring as far as the eyes are concerned.

Uncorrected as well as overcorrected hypermetropia, and uncorrected astigmatism, impel the eyes to try to see better. The former simply because the blur does not satisfy the previous ideal, and the latter because the ciliary muscle is astride of two foci and oscillates between them. Both cause an effort to see clearly, which, if prolonged, is followed by the familiar pain and headache of eye strain.

The muscular imbalance about which so much has been written is analogous: The impulse to see clearly requires an equilibrium of both eyes so that they shall be directed at an object with a minimum of effort. If there is an excess or a lack of convergence, still more, if there is a vertical defect, hyperphoria, an undue effort is made and the strain enters the field of consciousness, the act is no longer automatic, the eyes easily tire, prolonged work is difficult, and the various signs of fatigue appear. The book is brought nearer, which shows the exaggerated effort to overcome an obstacle. This is characteristic of the child, for relaxation or relinquishment of effort is not a part of his nature,

and may be compared with stiffening of the wrists in piano practice and with contraction of the throat in singing.

Now, this tendency to overdo may depend on errors of refraction, which should, of course, be corrected. It also depends in some instances on a minor imbalance of the external muscles of the eyes, which may disappear if the fusion sense is developed. This is apparent to anyone who first looks at geometrical figures through a stereoscope: One sees the images alternately, simultaneously, finally superimposed until the true sense of the third dimension dawns and the eyes are held without further effort in perfect binocular fixation. The difficulty had been an incoördination, lacking the control of the higher centers (Hering, Lohmann). Back of all nervous tension, however, is the increasing complexity of life, which impels the child to take himself too seriously. He shares the tension of the family and of the world; school ambition or pressure dominates; even sports are organized to an extent demanding more cerebration than the curriculum.

Many theories have been offered to account for myopia, but they have all met with more or less opposition—in fact there is no satisfactory explanation. On one point only most observers are united—that continued near work under unfavorable conditions, during the early years of school life, is in certain cases followed by a lengthening of the eyeball. The stretching of the sclera, if moderate, not exceeding 1 mm. or 3 D., may be unimportant as regards the health of the eye, but the choroid and the retina do not stretch so readily, but tend to yield and become thinner, and a disturbance of the rods and cones is apt to follow. Moreover, the limit of moderate or so-called “school myopia” is not to be assured, since an eye that begins to stretch, if the conditions of work remain the same, and especially if there is a depression of vitality, as is so often the case at or before puberty, continues to stretch and the retina suffers more and more until the actual dangers of high myopia are reached and the eye is vulnerable for life.

Heredity and disease have most to do with high progressive myopia, much less with school myopia, which tends to end its progression at or before puberty. Therefore the absence of myopia in the family makes the prognosis as regards increase of myopia in a child more favorable.

High myopia, with its disastrous complications, is becoming less frequent, but the lower grades of school myopia are not

diminishing, rather the contrary, if one may judge from an individual experience where no recent statistics are available.

It has been said, "If there were no fatigue there would be no myopia." This may well be a counsel of perfection, but it is true that if children were watched during their early school years, and the first signs of difficulty noted, and if the work could be adapted to the child's capacity, instead of expecting each individual to fit like a cog in a huge machine, regardless of the shape or resistance of the cog, it would be better for the cog and for the machine.

It is interesting to note that some writers, notably Donders, speak of myopia as "one of the many instances—within certain limits desirable—of the adaptation of an organ under the influence of use (*einflusse der Uebung*).” "I should not object," he continues, "if, ultimately, the student as well as the peasant should have the most useful eye for his needs." He means that the myopic eye is adapted for near work without glasses, implying an horizon limited to the walls of the library. Fortunately, we regard the question differently and a child condemned to the constant use of glasses is a natural cause of distress to the parents and should be a source of anxious watchfulness to teachers and physicians, even though the opticians profit.

I shall not speak of the use of glasses nor of the especial treatment required by a child with incipient myopia except to emphasize the importance of its early recognition and to repeat that it is our duty to focus all the medical forces on two points—nutrition and rest.

In an interesting article on the physiology of vision, Professor Cattell has suggested the use of certain tests which have been used only in the laboratory. Our present methods give as accurate results as are desirable for refractive errors and for muscular weaknesses, *but* they give us only the condition of the moment—they do not show the child's endurance or his fitness for certain tasks, and a single examination does not throw much light on the chances of the future, although the ophthalmoscope enables us to discover changes after they have begun.

It is not an infrequent experience to pronounce a child's eyes normal and to assure the parents that they appear equal to any reasonable effort, then a year later, often less, after the strain of the primary school, to find that he cannot see the blackboard, and the age-long slavery to glasses has begun. This may



be repeated from year to year until in college he has a myopia that makes lenses necessary for all distant vision. This sequence may be inevitable in many instances—a price paid for intensive education, or an instance of the misfit (better call it that than unfit) of a transitional period, but every ophthalmologist sees cases that might have been prevented, not by his efforts alone, but by the team work of the family physician, the specialist, the parents, and the teacher.

I have spoken of myopia as an example of progressive deterioration because it was within my own ken, but you see children with dilated hearts which may be analogous to the stretching sclera, some who are backward and easily tired, with twitching faces, those whose digestion is easily upset or whose nutrition is vaguely at fault. The field is large enough for all the medical wisdom obtainable. The point I wish to make is not that we should make much of these small matters, but that we should study them in a broad way, with the future of the child and his career in life always in mind.

Growth belongs especially to the well-nourished classes. Our large children, overtopping their parents, are a tribute to scientific feeding and hygiene, unless, as has been suggested to me by Dr. Southworth, the well-nigh universal custom of removing adenoids and tonsils may remove also an inhibiting influence on average or normal growth.

The term "normal" needs definition when applied to stature or growth. The increase in size among the better-cared for children of to-day is striking and may be a matter for congratulation, but it does not follow that the most efficient or the most enduring type is over six feet tall.

We know that when a child has grown too fast he is less capable physically and mentally of sustained exertion. He tires easily, loses ambition, possibly the heart muscle or the kidneys show some insufficiency, there may be a passing lack of resistance to staphylococci—perhaps one may generalize by saying that the viscera are not yet equal to the task imposed by the bulk of the frame and that the insufficiency is in direct proportion to the delicacy of the organ or to its functional activity. Naturally, rest is enjoined, or well-regulated activity with judicious feeding; but in the enforced idleness too often the eyes are forgotten, and it is a time for novels and newspapers, though the eye at *this time of all others* is vulnerable and also needs rest.

One speaks of fatigue and strain with a certain glibness, which, however, merely masks ignorance, for nothing is more complex in physiology or medicine. This is especially true of the eye, which is put to tasks for which it is not yet adapted, and is exposed to injury against which its protection is inadequate.

Muscular strain has been so well handled by Dr. Duane and many others that it would be rash to trespass. Fatigue, however, may well be discussed, although time permits only a brief outline.

Fatigue may be considered as weariness, in which the sensations are local or general, and true fatigue, approaching exhaustion, in which the function is impaired.

The ocular sensation of weariness, passing insensibly into fatigue, are familiar—red eyes, lachrymation, heavy lids, headache, blurred vision if the light is poor, dazzling if there is too much light or if the contrast between black print and white paper is too great.

There are also many nervous correlations of fatigue seen in susceptible children, which should be traced to their source. A fractious, nervous child is often tired out locally or generally.

The mental element is equally important, but here a different problem appears: Flagging attention may have several meanings. The child may be weary or simply bored, or he may not understand what is expected of him.

We know that a certain amount of weariness is a favorable condition for the best work. It rallies energies which were not at first aroused and provides "a set of attention" which puts the peripheral sensations of strain in the background. A certain amount of discomfort is unavoidable in school work with electric light, and often only the assurance is needed that no harm is being done to relieve anxiety and consequent tension.

In some children, when there seems to be a tendency to spasm of accommodation, and the beginnings of near-sight, homatropin may be used each Saturday night to relax and put the eyes at rest, and to avert the habit of spasmodic contraction.

Modern children are not naturally lazy—it would be better for them, perhaps, if they were—and the average youngster does not complain of the many discomforts that affect his introspective and neurasthenic parents. If, therefore, there are signs of stress or apparent obstacles in a reasonable amount of work, they should be studied sympathetically. The problem is psychological

as well as physical, and the psychology is that of common sense rather than of the laboratory.

There can be no doubt that the demands made by modern education are excessive. The nervous tension of daily life begins too early. Sports are too elaborately organized and competition too intense. Little is now spontaneous. Professor Patrick, who has written sympathetically on questions of education and is now Professor of Psychology at the Northwestern University, in his interesting book, "The Psychology of Relaxation," shows clearly how the war, which caps all other excesses of an age of extremes, may be charged to a tension lacking normal outlets. Football, strikes, politics, newspapers, finance, to mention a few of our exaggerations of the moment, show plainly a fault in early training. We lack mental perspective, we fail to see that the distant things are as interesting, that the large masses are as important as the details close at hand.

It may be difficult to retrace our steps, to regain a simpler life, but at least the children can be spared the nervous tension which has become a needed stimulant for their elders. The eyes may be rested by looking off along the distant avenue instead of at the details of windows and people. There is a mental rest, too, in relaxing the accommodation. Rooms should not be filled with small objects. Spaces and lines suggesting perspective suggest distance and rest. Pictures that carry the eyes away in a vista of distant hills are better than crowded decorations. Light should not be glaring. It is not probable that electric light is injurious, even when it is bright, but it wearies the eyes and the mind, as loud noises are wearisome.

It has been said that paper should be white and print black, the sharpest contrast possible, but that is distinctly exhausting to the retina, as is the glare of snow. On the other hand, the description of the "scrofulous French novel on gray paper with blunt type" applies well to most of our newspapers. Yet how many hours are spent by all ages over these muddy sheets in subways and badly lighted rooms! The papers and the movies are to solace the tired working man. The tired business man seeks Broadway and the cabarets. And so the people are refreshed. I am not speaking of ourselves—we, of course, live sedately—but of our patients.

Many of the questions raised are unanswered—the cause of myopia; how the retina suffers from overwork; what is the

nature and meaning of fatigue; how, if at all, does the eye suffer from an excess of light? These specific questions have been studied and half a century of keen and careful work has given no answer. It may never be possible to answer the questions categorically, because the factors are complex.

All degenerations depend on stress plus diminished resistance, with one or more unknown factors, varying in individual cases. The two elements with which we can best deal are stress and resistance, and both of these are more nearly under our control in childhood. It is possible that many of the degenerations which we call senile, *e.g.*, cataract, retinal changes in the macula, as well as the myopia and squint of childhood, may be dependent on faulty conditions or an excess of work when the organ is incomplete, as well as in advancing years when resistance is diminishing.

Let me review very briefly some of the points raised. I need not repeat what has been said of squint and myopia. With regard to fatigue, however, a few words may be added.

Ocular attention is the analogue of mental attention, since macular fixation may be compared to the mental focus. If the light is reduced the macula, with its cones which are relatively night blind, has less superiority over the rest of the retina than it usually has and is accustomed to, the fixation is less precise, the eyes are not held by the dominant impression and an effort is made as in secondary attention when there is a "conflict between nerve forces."

The ideal condition, then, of ocular work may be compared with derived primary attention. All defects of vision, of light, or of print, induce, then, a strain not only of the peripheral organs, but of attention. The psychology of attention—and there is much in that subject that can be applied to our problem—is given with simplicity and a remarkably clear exposition, by Professor Titchener in his "Text Book of Psychology" and his "Psychology for Beginners."

Fatigue is, therefore, a very complex thing, and we must distinguish between ocular strain, which is harmful, and mental strain, which is also undesirable, especially in children.

Too little light, gray paper, blunt, blurred type, are objectionable for obvious reasons, but the other extreme is also to be avoided. A small child who has not learned to read fluently scans each word, and there is formed an after image, an echo so to speak, too faint for perception, but which dazzles and fatigues



the retina, especially if the contrast between print and paper is too sharp or the light too bright. I have noticed this recently in selecting an edition of Shakespeare. An excellent handy volume edition, but with very black and rather heavy print, was rejected as dazzling, and an old volume was chosen on slightly cream-colored paper, with more delicate typography, smaller letters in fact, but spaced so as to make a less crude and lasting impression on the retina. I mention these points to indicate the importance of what may seem to you minor details in the conservation not only of ocular but of nervous energy. The length of line, spacing of letters and of lines, the weight of the book, etc., are worthy of attention, but need not be considered here.

The child reads with a continuity of fixation, unlike the adult, who grasps the meaning of the phrase at a glance and who traverses the page with a minimum of halts, three or four to a line, almost rhythmical and therefore effortless. The text is seen only in the halts, for the eye is blind when in motion—no one looking in a mirror has ever seen his own eye move, according to Professor Dodge, now at Wesleyan University, who has written most interestingly in a popular vein on "Vision," in Harper's of May, 1902.

Speed in reading can be greatly increased by practice, and speed is labor-saving in this age of books and the absurd profusion of newspapers. Moreover, it has been shown that rapid reading is not superficial—in fact, the concentration on the phrase or idea, rather than on the word, gives a more intelligent and lasting impression and entails less ocular effort. Professor E. B. Huey, in his book, "The Psychology and Pedagogy of Reading," elaborates these questions in a most illuminating way. The book should be read by all who are interested in the psychology and training of children.

The amount of reading required in school and college is increasing. Histories, for example, are diffuse and much collateral reading is expected. The demands of modern education are abnormal, as artificial as much else in our modern environment, and, as Professor Patrick says, there are evidences of a reaction which will increase until a more normal mode of growth is found.

We say that a child's endurance, or resistance, depends on his vitality, which means many things that can only be surmised as well as some that can be measured. So the relation between

the growing child and his environment is an ever-changing flux of assimilation and dissimulation.

It is here that the art of the physician is supreme, for the man who can collate the varied data that science offers, construing, eliminating, finally drawing a just conclusion, and at the same time can retain his grasp of the problem in its broader sense—of the individual in his environment, the past heredity, the future career, and the present with its conflicting claims of health and disease—such a man I could respect, did he exist. He may be a syndicate, however, for only a group of men, each equipped for his fraction of the task, could envisage the problems of one small patient.

The physician must assume the position of adviser with regard to the training of the child, not only in the physical field, but also in questions of education and in the choice of a vocation. No one knows the vitality and the resistance of the child as he should know it. The mental and emotional tendencies, as well, are not outside his field. The evidence offered by a careful examination of the special senses is of equal importance in the choice of a career. Who would think of preparing a boy with incipient myopia for the army or navy, and yet that occurs not rarely, through the ignorance of the parents or of the teachers. I could cite many instances of misfits, men who have failed and others who have succeeded in spite of grave physical handicap for whom a suitable career should have been chosen early in life.

The doctor must cope with the ignorance and indifference of some parents, with the overanxiety of others, and with teachers whose reputation depends on the passing of examinations near at hand, while our responsibility is linked with the later growth and development of the individual.

A plan suggested by Dr. Allan McLane Hamilton, and recently brought forcibly to our attention by Dr. Pearce Bailey, commends itself. They describe a clearing house in which the physician, the psychologist, and the various specialists may combine to determine the character of the youth, mental and physical, his aptitude and weaknesses, and his fitness for professional or vocational training.

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## A PEDIATRIC CENTER IN NEW YORK CITY \*

BY HENRY DWIGHT CHAPIN, M.D.

New York

Any community that aims to play a leading rôle in the advance of modern medicine must have a large population to draw upon. Clinical observation, teaching and research all require abundant and varied material for purposes of study, demonstration and the sifting of results that may have been suggested by theoretical considerations. It is only as the laboratory is closely joined to the clinic that the most fruitful and lasting results will be obtained.

Another factor of importance is the wealth of a community. The fact is sometimes overlooked that where money collects it is not only followed by the various arts, but by literature and science in all its forms. The commercial supremacy of New York is apt to cause its great importance in the manifold fields of art and science to be insufficiently appreciated. This is partly due to the fact that the city is so immense in area and population that it is somewhat lacking in that community pride and coöperation so often and so admirably shown by smaller cities. The absence of homogeneousness in population is also another cause of this lack of community spirit.

The latest estimate of the Department of Health puts the population of New York City at 5,602,841. The estimated number of children under sixteen years of age is 1,699,901. This population is the most cosmopolitan of any large city in the world. In the report of the Board of Health for 1915 of the deaths according to the nativity of the deceased, twenty-eight distinct nationalities are noted. Other unknown or mixed nationalities are finally added to these, showing how diversified is the population. There is probably not a strange or unusual race in the world that is not represented, many of them living in quarters by themselves.

Some foreign nationalities are present in very large numbers. Thus, according to the United States census of 1910, there were no less than 1,927,713 persons of foreign birth in the city. Of these, the countries represented by the largest numbers were: Russia, 483,580; Italy, 340,524; Germany, 279,242; Ireland, 252,528; Austria, 193,203. If those with foreign-born parents are included, the following figures are given: Russia, 721,469;

\* Read before the New York Academy of Medicine, Section on Pediatrics, November 9, 1916.

Italy, 532,310; Germany, 606,173; Ireland, 562,466; Austria, 289,529. These significant figures will show how largely New York is a foreign city and that, as far as cases and diversities of disease are concerned, one need not go abroad for purposes of study.

As a fair proportion of the foreign population is poor, dependence is largely given to hospitals and dispensaries for diagnosis and treatment of diseases. This, of course, affords abundant opportunity for a study of all kinds of maladies. The provision for the care of the sick poor in New York is enormous. As this discussion is limited to children, we will confine ourselves to a consideration of what is done for them. The data here given are taken from the recent Directory (1914) published by the Bureau of Child Hygiene of the Department of Health. There are sixty-four hospitals that make more or less provision for the care of sick children. A few of these are devoted exclusively to the care of infants or older children, a few are devoted to special diseases, but most of them are general hospitals, devoting some space—from one or two small wards to a whole division—to the medical and surgical diseases of children. An enormous amount of attention is now given in these various hospitals to the care of sick infants. A count of the beds that may be devoted to this purpose shows the astonishing number of 2,469. The smallest number given up to babies was two beds in one institution and the largest 800 in another (New York Foundling Hospital). The number of beds available for older children in these sixty-four hospitals is not given, but it must be very large. In the orthopedic and contagious disease hospitals most of the beds are occupied by children, while in the eye and ear hospitals a goodly number are likewise devoted to this purpose.

When we come to dispensaries and out-patient clinics, no less than seventy-six have departments for treating children.

There are thirteen asylums and homes for housing infants and little children. As the mortality is always very high in these institutions, a wide field for the study of pathology is thus offered. A consideration of these data will show what an enormous field New York offers for the study of pediatrics. One interesting fact that must not be overlooked is, that in spite of the diversity and density of population—certain areas in the lower East Side representing the most densely populated portion of the globe—the death rate is astonishingly low. The general death



rate for 1915 was 13.93 per 1,000, and the death rate under fifteen years was 14.68 per 1,000 of the estimated population under fifteen years. Many factors doubtless contribute to this low mortality, but, in line of our discussion, we must give due credit to hospital management as affording some contribution to this effect. It seems to show that the cases are often carefully studied and successfully treated. In times of epidemic, such as occurred during the past summer with infantile paralysis, the large numbers collected in a few of the hospitals offer exceptional chances for the study of the disease. The smaller communities have usually a greater number of cases of infectious disease relative to the population than New York, but the vast number of people here always renders possible a much larger collection of cases for observation and study.

One may well be confused in contemplating such a diversity of riches as New York offers to the student of disease. There has been too little attempt at coöperation in an effort to coördinate these various sources of study. The distances are so great that much time and energy may be lost in going from one hospital to another. Every institution should do its best, however, to make available all its resources for the serious student. As far as pediatrics is concerned, the staff of the Children's Department of the New York Post-Graduate Medical School and Hospital have tried to solve this problem by arranging a seminar lasting a month which aims to conserve the time of the physician with as complete a course as is possible under the circumstances.

This seminar is arranged in four courses as follows:

COURSE I: (a) Infant Feeding. (b) Dietetics in Older Children; Kitchen and Milk Analysis.

(a) History taking in gastrointestinal diseases of infancy; physical examination dealing with feeding cases only; instruction in writing directions, preparing food, etc.; various theories of infant feeding; percentage feeding; the top milk method; the infant's digestive ability and need for fats, sugars and proteids; caloric value of the various foods and the requirements of the different classes of infants; number and quantity of feedings in twenty-four hours; feeding of newborn babies and of normal infants when the caloric requirements should not be fulfilled; underfeeding and overfeeding; examination of stools; classification of diarrheas; constipation; the care of milk in the home;

breast feeding; indications for continuance or discontinuance. The diet kitchen of the hospital is used to demonstrate the preparation, bottling and care of the various infants' foods, together with milk analysis and adulteration.

(b) Feeding during the second year in normal and difficult cases; classification of foods; diet in nutritional disorders, such as rickets, scurvy, etc.; diet in chronic or prolonged illness, such as tuberculosis, nephritis, etc.; lavage and gavage.

COURSE II. (a) Laboratory Work in Pediatrics. (b) Pediatric Technic on the Cadaver. (c) Hygiene in Infancy and Childhood.

(a) Every effort is here made to correlate the ward and clinic cases with work in the laboratory. All the laboratory methods which may be of aid either in the diagnosis or treatment of children's diseases are studied. The various cutaneous reactions (von Pirquet, luetin, etc.), vaccines, the Wassermann reaction, immunity, metabolism, etc., in relation to children's diseases are here considered. Methods of examining the blood, spinal fluid, sputum, urine and stools are next taken up. Examinations of the various throat cultures and smears from cases of vaginitis are also reviewed.

(b) Studies on the cadaver include surface anatomy, normal and abnormal; inspection of cranium, neck, thorax, abdomen, spine and extremities; surgical procedures, such as intubation and extubation, tracheotomy, lumbar puncture, ventricular puncture, thoracentesis, paracentesis of membrana tympani, hydrocele, etc.

(c) Demonstration of proper clothes for infants and older children, the nursery, the bath, aerotherapy, ventilation, heating, exercises, amusements, hygiene of the baby's food and utensils.

COURSE III. (a) Physical Diagnosis. (b) Development and Correctional Exercises. (c) Contagious Diseases at the Willard Parker Hospital.

(a) This course is essentially clinical, and aims to give the student a comprehensive knowledge of the present methods of examining and diagnosing the various diseases of infancy and childhood. It includes systematic examination of the infant and child in connection with diseases of the thorax, heart, kidneys, bones and joints, liver and gall bladder, enlargements of the

spleen, nervous diseases, diseases due to lack of internal secretions, tuberculosis and congenital syphilis.

(b) Many children, although not suffering from orthopedic defects, need systematic exercises and training for their general development. In this course special attention is paid to deep breathing exercises, the correction of postural defects, increase in abdominal tone, exercises in cardiac conditions, etc.

(c) Clinics in diphtheria, scarlet fever and measles are held at the Willard Parker Hospital. In cases of unusual epidemics, such as the recent one of infantile paralysis, the various phases of such diseases are also exhibited at this hospital.

COURSE IV. (a) Anatomy and Physiology of the Normal Child. (b) Practical Pediatrics. (c) Preventive Pediatrics. (d) Infant Mortality and Social Pediatrics.

(a) A study is made of the head, neck and thorax, abdomen, with contained viscera, and the bones with reference to their periods of ossification. The physiology of the circulatory and digestive systems and respiration is considered. Such conditions as teething, taste, smell, speech, sight and hearing are studied in their physiological development.

(b) This course consists in individual clinical teaching. Both the common and rare diseases of infancy and early childhood are taken up. Patients are assigned to members of the class for examination, and the diagnosis and possible treatment arrived at are then discussed by teacher and class. Attendance in the wards and a study of ambulant cases in the dispensary will serve to emphasize the data that have been taught.

(c) It has been demonstrated that in pediatric practice prevention has its greatest application. This course is designed to present the modern methods of prophylaxis in a practical manner. For example, prenatal oversight, the special care of premature infants, the prevention of common diseases, of communicable diseases and of parasitic diseases are included in this study. Prevention of improper habits, speech defects, postural defects, and preventive measures in regard to the teeth and occlusion of the jaws are also taken up. Such subjects as the prevention of nutritional disturbances and measures in regard to the developing nervous system are also included.

(d) In this course are included death rates in various communities, birth registration, methods of registration, means of reducing the death rate, housing conditions, sanitation, institutions for the care of children, eugenics, midwifery, intelligent obstetric service, nursing and social work and education for mothers and young girls in the care of little children. It may be of interest to state that the children's department of this hospital was the first to inaugurate regular hospital social service—starting in 1890—and it has been in operation ever since.

Finally, a series of pediatric conferences has been arranged in connection with these courses in order to determine the individual needs of the student and to advise how these may be met. Themes dealing with some practical problem in pediatrics will be assigned to those making application and their work criticized. Recent pediatric literature will be discussed and the students made familiar with periodicals having a bearing on the work of this department. If it is desired, students will be assigned to do original research work, the amount and character of which will be dependent on the length of their stay and their previous preparation.

Other institutions and hospitals are likewise doing valuable work in making their resources available to physicians and students. To one who wishes great diversity in teaching and experience, no field in pediatrics is more inviting than New York. There are here to be found a goodly number of pediatricians who have a national and international reputation from the work they have accomplished. It would be well if some form of co-operation in teaching and research could be devised for the mutual benefit of students and investigators. There is no reason why exchange professors should not operate in large communities as well as nationally and internationally. The European habit of students migrating from one university to another in order to be inspired and taught by different teachers could be exemplified and simplified in a large community like New York. The disorganization of university efforts in Europe should afford New York a chance to greatly enlarge its opportunity for advanced work. With such great advantages it should become the medical center of the world in almost all the lines of effort. It may accomplish this great object if its professional leaders have the vision and will work together for such a promising future.

*51 West Fifty-First Street.*



## SOCIETY REPORT

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### THE NEW YORK ACADEMY OF MEDICINE—SECTION ON PEDIATRICS

*Stated Meeting, Held December 14, 1916*

ROYAL STORRS HAYNES, M.D., IN THE CHAIR

#### TUBERCULOSIS FROM RITUAL CIRCUMCISION

DR. MARK S. REUBEN reported this case. He stated that the patient came under his observation at the Vanderbilt Clinic in November, 1916, when nine months old. He had been circumcised on the eighth day by a mohel, who aspirated the wound by means of a glass tube. Within a week the entire wound of the circumcision had healed. Five weeks after the circumcision had been performed the mother noticed a swelling in the right groin. It was for treatment of this swelling that the infant was brought to the clinic. This same mohel who circumcised the patient had circumcised two other boys in the same family. These boys were five and seven years of age respectively and were both well. Physical examination of the patient was entirely negative; the spleen was not enlarged; the lungs were negative. The inguinal glands on the right side were enlarged, the mass being about the size of the little finger. Examination of the penis on casual observation presented nothing abnormal. The circumcision wound had completely healed; there was no ulceration. On closer inspection four small tubercular masses could be seen, each one separate and distinct and about one-eighth of an inch in diameter, on the anterior surface of the circumcision scar. On palpation of these little masses they felt hard and indurated, not unlike buckshot under the skin. The largest of these masses was excised and examined by Dr. Wilensky. The microscopical examination showed that the tissue was infiltrated with numerous tubercles and diffuse tuberculous inflammatory tissue. The von Pirquet reaction of the infant was positive. Examination of the mohel showed that he was suffering from advanced tuberculosis and his sputum was loaded with tubercle bacilli. Dr. Reuben stated that during the first two weeks after he first saw the patient

the infant had gained about 1 pound in weight and never had any fever. Excision of the tuberculous tissue of the penis and the inguinal glands on both sides was advised and would soon be carried out. Tuberculides of the skin were never present, though they were looked for. In the literature there were reported 42 cases of tuberculous infection following ritual circumcision; of these, 12 recovered and 16 died. The results in 14 cases were not known. The most common cause of death in these cases was tuberculous meningitis or general miliary tuberculosis. Those that died usually did so in from six to twelve months after the infection. The most rapid course observed was in a case of Holt's, in which the child died three and one-half months after infection. Those that recovered invariably showed other tuberculous manifestations in later life. The course of the disease might be described as follows: About fourteen days after circumcision the wound, which in the majority of cases did not heal, ulcerated and began to discharge pus; from two and one-half to eight weeks after the circumcision the inguinal glands became enlarged on one side, usually more on one side than on the other. The glands then usually suppurated and broke down. The treatment of these cases was early excision of the tuberculous tissue of the penis and the inguinal glands on both sides.

#### THE HISTORY OF PEDIATRICS IN NEW YORK CITY

DR. ABRAHAM JACOBI. (See page 1.)

#### THE PROBLEM OF THE CARDIAC CHILD IN NEW YORK

DR. L. EMMETT HOLT. (See p. 12.)

#### THE COUNTRY CARE OF THE CARDIAC CHILD

DR. HERBERT B. WILCOX. (See page 43.)

#### THE ELUCIDATION OF SOME ARRHYTHMIAS OF THE HEART IN CHILDREN BY MEANS OF THE ELECTROCARDIOGRAPH

DR. ROBERT H. HALSEY presented this paper, which will appear in our February issue.

DR. JAMES said he had been told that Lewis had seen fibrillation of the auricles and pulsus irregularis perpetuus once in a

child of two, and at very long intervals one met with this condition in children below twelve years of age, but so far as he knew it was always in association with well-marked mitral stenosis and very pronounced organic change in the heart, so that its recognition was simple and its significance easy to estimate and its treatment exactly as it would be in the adult. Extra systoles were fairly often met with in children, but here again their interpretation was simple, for you might safely assume that they were of the auricular variety and you did not need an electrocardiogram; while in the adult the differentiation of the one type of extra systole from the other could almost never be made without an electrocardiogram. Ventricular extra systoles almost never occurred in children, except from digitalis.

The other types of irregularities, such as auricular flutter and pulsus bigeminus, Dr. James said he had never met in childhood. This left only the sinus irregularities to be considered and we might reckon extra systoles with these, as in childhood they probably had practically the same significance.

Sinus irregularities then comprised almost all of the forms that were met with in infancy and early childhood. They were disturbances of function and had no organic significance whatever; they were to be regarded as normal phenomena and only when they were extreme in degree did they need any consideration whatever, and in these cases only because they indicated an unstable condition of the pacemaker, or governor of the heart. They suggested then merely that, as with any other machine whose governor was not working properly, the organ should be used with some care. It was therefore his habit in the case of boys who showed this type of irregularity very markedly, to advise against extreme athletic indulgences, assuring the patients that the trouble would inevitably clear up as the boy goes on and grows older.

Many young people were a little slow in developing automatic heart control, just as many of them were backward in developing control of their tempers, the control of their bladders, and certain other functions that were only very imperfectly developed very early in life.

Practically, this became a very important matter for the profession, for it was very common for physicians to be very much concerned when they discovered an irregularity of the heart in a child. Frequently a diagnosis of myocarditis was made and

harm was done through the unwise restriction of activity and the creation of a state of invalidism.

The speaker said it was perfectly fair to state that in childhood any irregularity of the heart that was not associated with perfectly clear demonstrable organic disease of the organ should be disregarded and should be considered a temporary peculiarity of function, which would disappear with time and which required no treatment whatever. To this it was perhaps fair to make one exception, though it would occur with such infinite infrequency as to make it hardly worth while considering; following one acute infectious disease, there might be a focal myocarditis involving the Bundle of His and producing heart block and so the pathological slowing of the pulse. This could only be positively diagnosed through the electrocardiogram, but in any child who developed a persistent pulse of from 32 to 40 following diphtheria or scarlet fever, it was fair to diagnose this condition.

Dr. James' said he would leave out of consideration those changes in the pulse which accompanied the later stages of a grave, acute, infectious disease, such as pneumonia. The character of these changes in children and in adults constituted a separate chapter. He was referring at the present time only to cases of intrinsic disease of the heart itself. Modern medical science had carried our knowledge of the diseases of the heart to such a point that we might hope to accomplish great good in the prevention of heart disease in children, and we might be almost as sanguine as to the ultimate outcome of our efforts looking toward the control and management of children who had already acquired cardiac lesions. To make our knowledge effective we should lay aside, as far as possible, differences of opinion and strive for unanimity and agreement as to the best method of attacking the problem. He felt confident that as soon as a united profession could offer to the public such a method, all the funds required for carrying out this work would be speedily forthcoming and we should add one more debt to the many which the community already owed the profession for lessening infant mortality and for improving the quality of the individual through wise methods of modifying his bringing up.



## DEPARTMENT OF ABSTRACTS

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### ORIGINAL CONDENSATIONS OF CURRENT PEDIATRIC LITERATURE BY THE EDITORS AND THE FOLLOWING ASSOCIATES

Charles E. Farr.....New York City	Raymond B. Mixsell....Pasadena, Cal.
Morris Friedson.....New York City	Rudolph D. Moffett....New York City
Gaylord W. Graves....New York City	Willard S. Parker.....Boston, Mass.
Howard K. Hill.....Philadelphia, Pa.	Mark S. Reuben.....New York City
Jerome S. Leopold....New York City	Mills Sturtevant.....New York City
William Lyon.....Jackson, Mich.	Samuel W. Thurber....New York City
John B. Manning...Seattle, Washington	Eugene F. Warner.....St. Paul, Minn.
Stafford McLean.....New York City	Edwin T. Wyman.....Boston, Mass.
Carlo D. Martinetti.....Orange, N. J.	J. Herbert Young.....Newton, Mass.

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BRENNER, EDWARD C.: CONGENITAL DEFECTS OF THE ANUS AND RECTUM. (Surgery, Gynecology and Obstetrics, May, 1915, p. 579.)

Recto-anal malformations result from faulty embryological development during the first two months of fetal life. The author divides the malformations into atresia ani and atresia recti. Atresia ani may be partial occlusion or narrowing of the anus, complete occlusion of the anus by a membranous diaphragm, total absence of the anus, the rectum ending in a blind pouch, or total absence of the anus with the rectum opening into the bladder, urethra, uterus, vagina, perineum or sacral region.

Atresia recti may be a partial occlusion or narrowing of the rectum, complete occlusion by a membranous diaphragm, or complete absence or extensive obliteration of the rectum. Other abnormalities are rectum and anus normal, but ureters, uterus or vagina emptying into the rectal cavity; absence of the large intestine, rectum and anus; and rectal diverticuli.

It appears from statistics that some rectal-anal malformation occurs once in every 5,000 births, with the sex ration 5 to 3 in favor of the males.

From a consideration of the operative treatment in recto-anal malformations, the author concludes that perineal dissection for fistulous openings gives excellent results and is a safe procedure. Perineoplasties for anal or anorectal obstruction in 29 cases reveals a surgical mortality of 24 per cent. Inguinal colostomy is attended with a high mortality of 66 per cent. Coeliotomy combined with proctoplasty is a novel and unique technique and promises good results.

C. E. F.

RUEDA PEDRO: ENLARGED BREASTS AND MAMMARY SECRETION IN INFANCY. (*Rev. Med. del Rosario*, September, 1915.)

The case described by Rueda is that of an infant of ten months, female, who showed a most exaggerated development of both breasts and a copious secretion of milk. The quantity averaged 25 grams and under the microscope showed globules of colostrum and other characteristics of normal milk. Reaction was neutral. The explanation of this peculiar condition could be found in the passing of placenta or ovarian ferments from the mother into the fetus through the cord. The only treatment required to effect a cure was a snug breast binder.

C.D. M.

MORQUIO, LUIS: AN INFANTILE AND FAMILIAL DISEASE CHARACTERIZED BY A CARDIOHEPATIC SYNDROME, AND DEATH IN ASYSTOLI. (*Arch. de med. des Enf.*, September, 1916, Vol. XIX., No. 9.)

A cardiohepatic syndrome in infants, not connected with rheumatism, suggests Hutinel's disease, which is characterized by ascites as its base, with a latent or hidden pericarditis. It appears, usually, in late infancy, with tubercular or occasionally hereditary syphilitic antecedents, and with hypertrophy of the liver and recurring ascites, along with cyanosis, fatigue, absence of auscultatory signs, immobility of the heart, progressing up to death in from one to two years. The author reports a condition not quite similar because of its etiology, and because of its familial aspect. Its pathology allows it to be classed as a new condition, not found in medical literature, in the ever increasing list of familial diseases, although the author is not able to fix its true nature by autopsy, or the anatomical location to account for the clinical manifestations. The case was one of a young girl, nine years old, born in Uruguay, one of a family of ten. She was admitted to the hospital in 1909, with a negative family history, excepting that a sister died at the age of fifteen years with similar symptoms. She was always well until five months previous, when the face and legs began to swell, and later the abdomen. There was also cyanosis, with a violet plaque on each cheek, and blue lips, as well as extremities, evident in spite of being sunburned. The heart area was enlarged 18 cm. horizontally and 12 cm. vertically, the apex beat being in the sixth space, nearly into the axilla and not changed by position, with

cardiac pulsations in two or three interspaces. The sounds were feeble, with a gallop rhythm to the left, a soft puff at the apex, resembling an extra systole, and arrhythmia, but no organic murmurs. The pulse was small, rapid and irregular. The liver extended 18 cm. vertically, to the left to the hypochondrium, with a smooth, projecting surface. The spleen was not palpable. The lungs negative. By X-ray the heart showed a diameter of 19 cm. in the shape of a bun. The shadow of the great vessels was enlarged. The urine showed a slight albuminuria, with no casts, and indican markedly positive. The blood count showed: red blood corpuscles, 5,650,000; white blood corpuscles, 12,500; hemoglobin, 90 per cent.; polynuclears, 75 per cent.; lymphocytes and large mononuclears, 25 per cent.; eosinophiles, 0. Under rest, milk diet and theobromin, the child lost 5 mg. in weight, and passed about a liter of urine a day. Under digitalis, for the arrhythmia, the weight again increased. She slept well, her intelligence was fairly normal, but talked very little. Stools were normal. The child died at home a month after leaving the hospital.

In 1914, five years later, a brother, aged six years, was sent to the hospital with diagnosis of cyst of the liver, which had shown symptoms for a month and a half. There was variable edema and marked cyanosis, with a markedly enlarged liver and heart. The apex did not change with position; skin reactions normal, no mediastinal adenopathy, urine normal, Wassermann negative; blood count: red blood corpuscles, 5,125,000; white blood corpuscles, 6,750; hemoglobin, 95 per cent.; polymorphonuclears, 76 per cent.; lymphocytes, 20 per cent.; large mononuclears, 4 per cent.

After three weeks in the hospital, with improvement under digitalis, the child was taken home and died four months later. Autopsy was denied, and so the nature of the pathological process was not verified.

It would have been very curious if tuberculosis, which was not revealed in any other member of this large family of ten children, should have appeared in all three of these patients in the same peculiar clinical rarity. This was the first difference from Hutinel's disease. A second important difference was that the disease appeared spontaneously in perfectly healthy children, and with all the characteristics of a familial disease. In addition, the heart was very large; there was an absence of bronchopul-

monary and mediastinal lymph node signs; no fever; and the ascites was in relation to the general edema.

May we suspect a congenital heart lesion? We have seen a malformation of the heart in three children in the same family, characterized by a murmur and cyanosis and dying at nearly the same ages. Usually, however, the cyanosis is seen from the first moments of life and nothing could be more alike than these cases reported. Cadet de Gassicourt has especially called attention to the fact that the pericardium is usually involved in deaths in asystole with exudations when acute and adhesions when chronic. These cases permit the conclusion that there was a pericarditis with possible adhesions. There is also a resemblance, without any other etiological connection to the pathology of cirrhosis of certain organs, especially the liver with chronic jaundice, or hypertrophy of the spleen of the Hanot type, or familial jaundice with splenomegaly of the Gilbert type. Apert, in his interesting work, "Familial and Congenital Diseases," does not mention any similar condition referable to the heart. The author has no explanation or hypothesis of the nature of this process.

H. K. H.

PETERSON, EDWARD W.: *INTESTINAL OBSTRUCTION IN CHILDREN, WITH SPECIAL REFERENCE TO INTUSSUSCEPTION.* (New York State Medical Journal, July, 1916, p. 357.)

Intestinal obstruction is divided by the author into congenital obstruction and acquired obstruction. The congenital obstruction is further divided into imperforate anus; intestinal occlusion or stenosis; volvulus due to torsion of the umbilical cord or to inflammation of the mesentery; and bands. Acquired obstruction he classifies as intussusception; strangulation of hernia, external or internal, from omphalomesenteric remains, bands or adhesions; volvulus; obturation, enteroliths, tumors; foreign substances; pressure obstructions by displaced organs, tumors; intestinal paralysis; and infarction of the mesenteric vessels. Of the congenital variety, those in the anal or anorectal region occur most frequently.

A case of mesenteric thrombosis, 1 case of acute angulation and obstruction by a congenital band, 1 case of plum stone impaction and 1 case of pressure obstruction from an abdominal abscess have been encountered by the writer.

Intussusception is the most common form of intestinal ob-



struction in children. Seventy per cent. of all cases occur in the first year of life.

In infancy the acute form predominates. A healthy, well-nourished infant seized suddenly with pain of severe abdominal nature, with more or less pallor, shock and relaxation, with vomiting and later blood and mucus in the stool gives a fairly typical picture. When an abdominal tumor can be palpated, the diagnosis is reasonably certain. The tumor is more apt to be round than sausage-shaped.

The intermittent paroxysmal nature of the seizure is characteristic of intussusception. Ileocolitis and the purpuric diseases have been mistaken for intussusception. In ileocolitis there is fever, diarrhea with mucus and blood and no abdominal tumor. In purpuric disease hemorrhage elsewhere besides the intestine gives the clue. Intussusception may develop as a complication of these diseases.

The treatment advised by the author is laparotomy as early as possible. The best incision is usually to the outer border of the rectus muscle. Disinvagination is best accomplished by pushing rather than by pulling out the intussusception.

In the author's series of 25 personal cases there were 16 male and 9 female, ranging in age from six days to three and one-half years. In 9 cases the intussusception was either gangrenous or irreducible, with 8 deaths and 1 recovery. In 14 cases reduced manually there were 3 deaths and 11 recoveries. In the 12 successful cases the average time from onset to operation was twenty-four hours.

The author concludes that intussusception in infancy gives a characteristic picture, that aerohydrostatic and mechanical measures can succeed in but a limited number of cases and that early laparotomy is the simplest, the safest and the most successful method of treatment.

C. E. F.

LASSALLE M.: REPORT ON A CASE OF BARLOW'S DISEASE. (*Arch. des Malad. des Enf.*, 1915, No. 2.)

The patient, an infant eighteen months old, had been from the sixth month nourished exclusively with cow's milk. Symptoms of intolerance appeared, diarrhea, loss of weight, and rashes all over the body. Cow's milk was discontinued altogether and Mellins' Food substituted with immediate and satisfactory results. Gradually a diet was planned consisting of cream

of wheat, rice, gruels and other cereals. All progressed well until the sixteenth month, when constipation appeared, accompanied by stomatitis and hesitating walk. The author was called in to diagnose. Lower limbs were painful and in several parts of the body ecchymotic spots plainly visible. The gums were very red and sore.

A citric acid mixture was prescribed, the cereals were discontinued, raw milk, vegetables and soups were prescribed. Two weeks later the patient had practically recovered. Lassalle concludes that infantile scurvy is caused not so much by cereals as by forms of prepared and condensed milk. C. D. M.

GROSSMAN, JACOB: FRACTURES IN CHILDREN. (Medical Record, July 8, 1916, p. 52.)

The author states that an injury that will produce a dislocation in an adult, will produce a fracture in children. This is due to the soft and elastic character of the young bones.

Many fractures in childhood are overlooked, due to the absence of crepitus, false mobility, deformity and ecchymosis. This absence can be accounted for in children by (1) an impaction of the fragment may be present; (2) one fragment may be too small or firmly attached to the surrounding parts; (3) it may be an incomplete fracture, being the fissure or torsion variety. This is the most frequent source of error. These types are known as subperiosteal or intraperiosteal fracture. By making pressure by the back of a pen or pencil the author believes that usually the fracture can be mapped out along the line of maximum tenderness. This he calls "pencil tenderness." He reports 3 cases diagnosed by tracing the line of pencil tenderness, all of which were confirmed by the X-ray pictures.

In the author's series of 200 cases there were only 2 cases of epiphyseal separation. Usually when the child refuses to use the limb for any length of time fracture is present.

In general, the treatment of fractures in children is much simpler than in adults, as the thick periosteum tends to prevent dislocation and the tendency to heal is greater.

After considering the special sites of fractures and their treatment in detail, the author concludes that in treating fractures in children the tender skin, movable cover of fat enveloping bones, and round agile body must be kept in mind. He believes that immobilization should be much shorter and emphasizes the

importance of pencil tenderness, the proper retention after reduction and the value of early massage, passive and active movement in restoring function.

C. E. F.

JEANNERET, L.: DIGESTIVE DISTURBANCES IN TUBERCULAR INFANTS. (*Arch. de Med. des Enf.*, 1916, No. 1.)

Combe first noticed the fact that in children affected with tuberculosis there existed besides a form of alimentary dyspepsia due to excessive nitrogenous diet, another form purely organic and primitive. Jeanneret found this to be the case in a series of 200 cases, of which 30 per cent. presented digestive disturbances; this not only in well pronounced tubercular cases, but also in those very slightly affected. The line of treatment followed was this: avoidance of alkalines, balancing diet carefully by finding out exactly the amount of nitrogen the gastric secretion is capable of treating, administration of acid that is usually deficient, care of the secondary enteritis, adding to this the regular treatment for tuberculosis. Deficient hydrochloric acid seems to be noticed in practically all cases.

C. D. M.

BURNHAM, A. C.: FRACTURES ABOUT THE WRIST IN ADOLESCENCE AND IN CHILDHOOD. (*Annals of Surgery*, September, 1916, p. 318.)

Colles' fracture is uncommon in childhood. Skillen found 4 Colles' fracture cases in a series of 100 cases of fracture of the forearm in children. In Vanderbilt Clinic, the author found from 65 fractures about the wrist in 1914 to 1915, 15 occurred before ossification of the lower end of the radial epiphysis. One of these might be classified as Colles' fracture.

Vulliert divides fractures about the wrist into three classes in childhood: (1) Epiphyseal separation. Four of this kind were in the present series. (2) Fractures by "Tassement." This is usually about 2 cm. above the epiphyseal line. In this the radius is bent but is not separated, the radial fragment being deflected dorsally. (3) Fracture of flexion. The line of fracture may be near the epiphyseal line or may be 3 or 4 cm. above it. Green stick and complete fracture are included here and the ulna is nearly always fractured. The lower fragment is displaced to the dorsum and to the radial side. Eleven cases of this type were in the present series.

From the cases studied, it appears that the common lesion

in young children is a fracture of both bones and not a fracture of the lower end of the radius. There is no separation of the epiphysis. The radius is fractured considerably above Colles' site, probably due to the fact that the bones of children contain more cartilage towards the ends and are consequently much tougher at this point.

The same force that produces Colles' fracture in adults produces the above type in children.

In this series there were 5 cases of epiphyseal separation, 4 occurring between the thirteenth and the fifteenth year inclusive. A fall upon the extended hand was the exciting cause in all of these.

In the second group there were about 3 cases.

From this study it may be concluded (1) that typical Colles' fracture is very uncommon before early adult life; (2) that before the twelfth year the common type of fracture about the wrist is fracture of both radius and ulna, either greenstick or complete; (3) that separation of the lower end of the radial epiphysis is of frequent occurrence during the early part of the second decade; (4) that the line of fracture is always higher than in adult life; (5) and that in fracture of the lower end of the radius in early life an associated fracture of the ulna is usually present.

C. E. F.

FERREIRA DE MIRA, M.: INFLUENCE OF SUPRARENAL GLANDS ON GROWTH. (*Arch. Inter. de Phys.*, 1914, No. 1.)

The removal of the suprarenal capsules in a young animal resulted in deficient development with increase of length and fragility of osseous tissue. Several months after the operation the difference between the animals thus treated and those left normal was so great that they might have belonged to different species.

C. D. M.

FOWLER, R. H.: PERSISTENT DEVELOPMENTAL ANOMALIES OF THE POSITION OF THE LARGE INTESTINE, WITH ESPECIAL REFERENCE TO THE ASCENDING COLON AND CECUM. (*Medical Record*, February 26, p. 353.)

As the number of surgical examinations and radiographic examinations of the chronic abdomen have increased, intra-abdominal congenital malformations are becoming more common. In considering the large intestine, many abnormalities are due



to failure to rotate or incomplete rotation during the developmental period. Thus the cecum may assume a position at any point between the right iliac fossa and the left side of the pelvis. Congenital openings in the diaphragm may permit the colon to be contained in the sac of a hernia, and situated in the pleural cavity. The author has reported such a case. In the present paper he reports 4 cases of persistent anomalies of the ascending colon and cecum. In the first case the cecum was high, of the conical type, and with the appendix adherent through its entire length to the posterior cecal wall. In the second case the ascending colon was absent and the cecum was fixed by adhesions embracing the appendix, which was situated beneath the liver. In the third case, the cecum was found on the left side at the level of the umbilicus with a gangrenous appendix attached. In the fourth case the appendix was found one and one-half inches above and one and one-half inches to the right of the umbilicus. The frequency of the total absence of the ascending colon is given as 2 per cent. by Treves and partial non-descent in about 7 per cent. From 1910 to 1912 the Mayos have observed 5 cases in which the colon failed to rotate.

The author suggests points which are of aid in determining the exact preoperative lesion: (1) Signs and symptoms of pelvic leftsidedness subhepatic or retrocecal appendicitis. (2) Differences in the colonic percussion note. (3) Gastrointestinal radiography.

C. E. F.

SEGARD, M.: DIGESTIVE DISTURBANCES AND ADENOIDS. (L'Hôpital, 1914, No. 6.)

Children affected with adenoids frequently present alterations of the digestive function caused by infections entering by way of the tonsils and of the adenoids themselves. Mucus laden with virulent microbes is constantly swallowed in large quantities and sooner or later carries infection to the digestive tract. A similar thing is found in adults with atrophic or hypertrophic rhinitis.

C. D. M.

STAEHLIN, EDWARD: CONGENITAL CYSTIC KIDNEYS: ETIOLOGY AND CLINICAL INFERENCE, WITH A REPORT OF A CASE. (American Journal of Surgery, April, 1916, p. 110.)

According to Kelly and Burnam, the disease is encountered principally before and after birth, and after forty years of age.

Between birth and twenty years of age Sieber was able to find in the whole literature only 32 cases.

The author's case was a woman twenty-seven years old. He does not believe that all polycystic kidneys are congenitally cystic. Some are due to acute cystic dilatation of the tubules as the result of parenchymatous nephritis due to a blockage of the narrower descending loop of Henle by the shedded cells of the first convoluted tubules.

All congenital polycystic kidneys are bilateral and due to a lack of fusion between the secretory and the collecting tubules.

In the author's case no symptoms were noticed until the abdomen began to increase in size. There was a feeling of fullness, colicky pains, hesitancy in urinating and constipation. Examination revealed a hard indurated mass in the lower left quadrant, diagnosed as myoma of the uterus. Operation revealed a polycystic kidney, which was removed. About six months later the patient complained of a tumor forming on the right side and a diagnosis was made of bilateral congenitally cystic kidneys. This seems to prove that while in this condition both kidneys are affected, they are not equally involved, and when one kidney is removed the other kidney develops its cystic tendency.

Treatment should be symptomatic and the organ should not be removed, as even most attenuated layers of medulla have glomeruli which are functioning. Cysts may be punctured if necessary.

C. E. F.

MORQUIO L.: ABNORMAL FORMS OF SCARLATINA. (Riv. Med. de l'Uruguay, 1915.)

After considering a large number of cases the author describes the following types: Scarlatina without fever, without sore throat, without rash, without desquamation. After outlining each of these stress is laid on the importance of diagnosis for prophylactic measures.

C. D. M.

GUIGON, Y COSTA: EPIDEMIC OF DUKES' DISEASE. (La Ped. Esp., 1915.)

During an epidemic of Dukes' disease the close study of many cases and of their inception convinced the author of the identity between this affection and a mild form of scarlatina.

Directions as to therapeutic measures follow.

C. D. M.

# ARCHIVES OF PEDIATRICS

FEBRUARY, 1917

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PUBLISHED MONTHLY BY E. B. TREAT & CO., 241-243 WEST 23D STREET, NEW YORK

## ORIGINAL COMMUNICATIONS

### THE COAGULATION OF COW'S MILK IN THE HUMAN STOMACH

BY JOSEPH BRENNEMANN, M.D.

Chicago

Our knowledge of the coagulation behavior of milk in the human stomach is still quite incomplete, and until recently was based almost wholly on indirect evidence.<sup>1</sup> We have known more about the action of rennin on milk in the stomach from test tube and from animal experimentation than we did from direct observation of this process in the human stomach itself. While experimentation in the test tube or in an animal probably reveals quite closely what occurs in the human stomach, nevertheless such knowledge was inferential and hypothetical and lacked that precision that comes only from direct observation.

<sup>1</sup>Brennemann, Joseph: Boiled vs. Raw Milk. An experimental study of milk coagulation in the stomach, together with clinical observations in the use of boiled and raw milk. Journal of American Medical Association, February 22, 1913, pp. 575-582.

When we attempt to observe the coagulation of milk in the human stomach itself we are confronted by serious obstacles. Direct inspection of the stomach contents *in situ* is impracticable. X-ray examination introduces a foreign element and is very limited in its revelations. The stomach tube that has been the chief instrument in bringing stomach contents to the surface so that they can be studied is here worse than useless, because any deductions based on its use are wholly fallacious. The gastric fistula is of little value because of its unnaturalness, because of the impossibility of watching the curd formation and because no fistula would be large enough to permit of the delivery of such curds as are formed in the stomach under ordinary circumstances.

The necessary condition for the accurate observation of milk coagulation in the stomach itself is the ability to empty the stomach at will, rapidly and completely, and without injury to the curds. The stomach contents, under such conditions, could be brought under direct observation at any desired interval, and any stage in the process of coagulation could be studied. *Such conditions are found only in the act of vomiting.* The use of an emetic, *per orem*, is, however, quite objectionable, because of the uncertain time element, the introduction of a foreign substance and also because of the extreme discomfort that accompanies its use. The hypodermic use of apomorphine is open to much the same objections.

Now, it is a matter of common knowledge that there are certain persons in whom the vomiting reflex is readily elicited by digital irritation of the fauces. Such an individual, after an uncomfortably heavy meal, or an excess in drinking, can pass the finger into the throat and get instant relief. At a time when I was interested in determining the difference between the curd of raw and of boiled<sup>1</sup> milk in the stomach, I was fortunate in finding an individual who was willing, reliable, favorably situated, and with this ability, without much effort and with a minimum of discomfort, to empty the stomach at a moment's notice by this simple expedient. Our idea at first was to make two attempts—one with raw milk and one with boiled milk. But our results were so gratifying, so instructive, so startling, and the discomfort so small that our investigation was gradually extended, over a period of several years, to nearly one hundred experiments with raw, boiled, pasteurized, fat-rich, fat-free, dried, condensed, diluted, alkalinized, acidified and otherwise variously modified



milks. Some of these experiments have been recorded in a former paper<sup>1</sup> that dealt with the comparative coagulation of raw and of boiled milk in the stomach, with special reference to the pathogenesis of hard curds in infants' stools that had been shown in a preceding paper<sup>2</sup> to occur only when raw milk was fed. In this paper I shall consider coagulation of milk in the stomach as a general phenomenon without special reference to its pediatric or therapeutic bearings, except as these intrude themselves, and shall confine myself wholly to its physical aspects, the time of coagulation, the comparative size, nature, appearance and consistency of the curds, the characteristics of the whey, etc.

In general, our method of procedure was as follows: Before breakfast the desired milk or milk modification was taken on an empty stomach; unless otherwise stated, the mixture was warmed to 95° to 100° F. and was swallowed within five minutes if it was a quart, and within two minutes if it was a pint. After the desired interval the stomach contents were returned in the manner above stated. In some of the experiments where this interval was long, and most of the whey had passed on, it was necessary to drink water so that the curds could be returned. At first a quart of the liquid was used for each experiment because that seemed, relative to its weight and needs, to correspond to about what an infant would take at one feeding. So large an amount became irksome, however, in the course of time and in the later experiments only a pint was used. This was done only after satisfying ourselves by repeated trials that there was no perceptible difference in the coagulation of the larger and the smaller amounts. In every case certified milk was used, always as nearly as possible under the same conditions. After the stomach contents were returned they were carefully examined and described, and then formalin was added up to 10 per cent. of the total mixture. This hardened the curds in a few hours to an almost ivorylike hardness and permitted of their permanent preservation either dried or in the formalin solution.

In the earlier experiments a thirty-minute interval was allowed to elapse between the taking of the mixture and the return of the stomach contents. For comparative purposes this interval was the one adopted as the rule. While a longer interval would for

<sup>2</sup> Brennemann, Joseph: Contribution to our knowledge of the Etiology and Nature of the Hard Curds in Infants' Stools. *American Journal of Diseases of Children*, May, 1911, p. 341.

some reasons have been better, nevertheless the thirty-minute interval was probably as serviceable as any. Departures from this interval were, of course, made when the effect of time on coagulation was studied, and at other times for obvious reasons. Often, for one reason or another, the same experiment was repeated several times. These will be recorded in detail to show how constant the action of the stomach was under like conditions.

Throughout an investigation of this kind on one individual, the question arises insistantly whether this is a phenomenon peculiar to this individual or a normal one for all individuals. Such a question could be answered decisively only by repeating the same experiments in a large number of individuals. My own impression has been increasingly firm that what I have observed and am recording here is a normal reaction, and I believe that in a question of this kind a general impression, gained from a large number of experiments, should have a great deal of weight. To see a repetition of an experiment always lead to a result identical with the first, to see over and over again results that could be definitely anticipated because they followed laws that had been determined in previous experiments, to see a series of experiments "run true" with mathematical precision—all of this forces the conviction that we are dealing with a stable, normal reaction and not with a freak.

The subject, moreover, was a young adult in perfect health, with no stomach, intestinal or constitutional trouble, with no antipathy or idiosyncrasy to milk, and with a gastric juice that was normal. *A priori* we would expect such an individual to react normally rather than abnormally.

Several of the more striking experiments, too, were repeated<sup>1</sup> on myself with essentially the same results. The fact that apomorphin, hypodermically, was necessary in my case would hardly alter the result.

These observations, furthermore, are quite in accord with clinical observations on the effects of various milk foods as used especially in feeding babies.

Even if we cannot accept as demonstrated the universality of these isolated results, nevertheless they would seem to serve acceptably as a working basis for further clinical and experimental observations, by which they must ultimately be measured.

Another question that occurred constantly was, Is the

stomach emptied completely? Do we see all that is going on? These questions cannot, of course, be answered with undoubted precision in every case. With increasing experience, however, there was very little doubt in any case that we had a knowledge of what was going on sufficiently accurate for our purpose. Fortunately our task was largely to observe and to record what we did find, rather than what we did not find, and so negative findings could be ignored. In very few instances was there any doubt that the record here made corresponded with the facts, and when such doubt existed it is so stated. There was never any inability to return the stomach contents, except in a few instances where the curds were so large that they could not be returned and then that fact was established, in one way or another, to our complete satisfaction.

The practical bearing of this series of observations is especially evident in the feeding of babies whose natural food is a milk that forms an almost imperceptible coagulum. Cow's milk, on the other hand, as it comes from the cow, forms in the stomach curds that are hard and enormous in size. *Cow's milk is not a liquid food, but a solid food—so solid, in fact, that in babies the curds found in the stomach often pass through the whole intestinal tract and appear in the stools as large, hard, beanlike curds.*<sup>2</sup> Cow's milk is evidently well adapted to the digestion of the calf as a preparation for the solid food that a calf gets early in life, and the problem of artificial feeding of infants has been largely to adapt this calf's food to the baby that is not prepared for solid food. Boiled milk has a much softer and finer curd, and nearly all of the numerous devices that are used in infant feeding in adapting cow's milk to the infant are directed, consciously or unconsciously, to modifying this curd so that it will be fine, soft and flocculent as is that of breast milk. The internist must likewise be interested in whether he is feeding a truly solid food like raw milk, or a relatively liquid food like boiled milk, cereals, toast, etc., in typhoid, in gastric or duodenal ulcer, in pyloric stenosis, and in other conditions.

In this series of experiments I shall begin with what may be considered our standard of comparison—raw cow's milk returned from the stomach in thirty minutes. The coagulation of raw cow's milk will then be taken up chronologically. This will be followed by observations on the coagulation of boiled, pasteurized and modified milk under various conditions.

## THE COAGULATION OF RAW COW'S MILK

EXPERIMENT 1. *Interval thirty minutes. Fat-free milk.* A quart of raw *fat-free* milk was warmed to 100°F., was swallowed within five minutes and returned from the stomach in thirty minutes. There was very complete separation of curds and whey. In the clear, straw-colored whey there were lying enormous curds that were firm, even rubbery—so hard that they could be picked up and handled freely without injury to them. So large and hard were these curds that they caused a sensation of alarm as they passed the throat. The average size was from that of a hazelnut to that of a walnut; several were two inches long, and one was three inches long, and for the greater part of its length one inch in diameter.

EXPERIMENT 2. *Interval thirty minutes. Whole milk.* This was an exact duplicate of Experiment 1, except that a quart of *raw whole* milk was taken instead of *fat-free* milk. The result was the same, except that the whey was a little milkier, and the curds were yellower, somewhat softer and less rubbery, but were even larger than in the preceding experiment. One curd was four inches long. Another came into the throat, stuck for a time, had to be reswallowed, and then resisted all further attempts at delivery.

## THE EFFECT OF TIME ON COAGULATION IN THE STOMACH

EXPERIMENT 3. *Interval two minutes.* One pint of warm (100°F.) raw whole milk was taken in one minute, returned in two minutes. The milk appeared distinctly granular when moved from side to side in a shallow layer, in a dish, and soft curds of considerable size could be seen to separate themselves from the rest of the milk. By the time this was done the process of coagulation had of course proceeded beyond two minutes. When the stomach contents were allowed to stand for a time a solid cake of coagulum was formed with the upper surface smooth and dense, the lower portion porous, very much like a rubber sponge. This latter was, of course, simply a continuation of coagulation of milk by stomach contents *in vitro*.

EXPERIMENT 4. *Interval five minutes.* Same as Experiment 3, except that the milk was returned in five minutes. There



was complete separation of curd and clear, straw-colored whey. Many curds were up to one inch in length, while the average size was from that of a pea to that of a lima bean. Many larger curds were evidently the result of an agglutination of many smaller ones. One large collection of loosely connected curds was two inches long and three-quarters of an inch wide, and several were one to one and one-half inches long by three-quarter to one-half inch wide. The larger curds have a sort of packed, squeezed, rounded off appearance, as of they had been pressed or packed together.

EXPERIMENT 5. *Interval one hour.* A pint of raw whole milk was returned in one hour. At the first attempt only a few small curds were returned with a small amount of whey. After a drink of water an enormous curd, shaped like a cuttle-fish bone, four and one-half inches long by one and one-half inches wide by one-half inch thick, was returned, together with many smaller ones. This curd was lodged for a time in the esophagus and was only dislodged after considerable effort. It gave the impression of being only a part of an originally larger mass. Another curd, two inches by one and one-half inches by one-half inch was evidently composed of a number of curds matted together. The rest of the curds varied in size from that of a pea to a length of one to two inches, and nearly all had a rounded, packed appearance. There was also about a level tablespoonful of fine detritus. All of the curds were thickly coated with mucus and were somewhat entangled in it. This slippery mucus was very much more abundant than in the former four experiments. When the curds were allowed to sink in water, fine, filmy, feathery strings of mucus were raised perpendicularly to the surface of the curds and contained many fine air bubbles. The large curds sank quickly—the finer detritus floated in the water. The curds were larger than in any previous experiment, and much harder, so that they could be handled roughly without breaking, as shown by the fact that such a curd could be delivered at all. The stomach contents were distinctly bitter for the first time, showing peptonization.

EXPERIMENT 6. *Interval one hour.* Exact duplicate of Experiment 5, after interval of one year, except that 1 quart was used instead of 1 pint. The result was exactly the same, except that no one curd was as large as in the former experiment.

EXPERIMENT 7. *Interval two hours.* A quart of raw whole milk was returned in two hours. About 1 pint was returned. It was more bitter than in any previous experiment, and had for the first time a decided odor and taste of vomitus. There was no longer any clear, straw-colored whey, the fluid accompanying the curds was turbid and grayish. There were comparatively few small curds, but the remaining curds were the largest passed in any experiment of the whole series. One curd was five inches long and extended laterally at right angles at each end, two and one-half inches at one end and one and one-half inches at the other, and was from one-half to three-quarters inch thick. Another was banana-shaped, three inches long and one inch in diameter. Still another was two and one-half by one and one-half by three-quarters inches. They were even harder than before, and were all smooth and rounded as if the sharp corners had been packed down by the smooth stomach wall.

EXPERIMENT 8. *Interval two hours.* Exact duplicate of Experiment 7, except with only 1 pint of milk. Nothing was returned with the first attempts. After swallowing two tumblers of water several small curds were returned. A large curd came up to a little above the lower end of the sternum and lodged there, "like a piece of tough meat." With another drink it was distinctly felt "to go down." In spite of four more drinks of water and as many efforts to return this mass it could not be returned. Altogether a tablespoonful or more of frothy, flaky, finely divided slimy detritus was returned with five or six hard curds, varying in size from that of a bean to that of an almond. All were rounded and packed, and were evidently aggregations of smaller curds. Unquestionably, as we shall see from later experiments, nearly all of the curd was here collected in one large mass that could not be returned.

EXPERIMENT 9. *Interval three hours.* One quart of raw whole milk was returned in three hours. Nothing could be returned until some water was taken. A number of hard, rounded curds were passed varying in size from gravel up to one that was the size of a small, unshelled almond. There was also a tablespoonful of white, feathery, slimy, flocculent detritus that was entangled in a mass of mucus and floated in the water. The stomach contents were said to be very "bitter," and had a strong odor of vomitus and higher fatty acids.

EXPERIMENT 10. *Interval five hours.* One quart of raw whole milk was returned in five hours. Nothing could be returned until a large tumbler of water was taken (9 ounces). Even in this dilution it was reported that the taste was "very bitter," but even more noticeable that it "left a horrid taste in the mouth as after taking vinegar." The fluid was very turbid and was filled with feathery, whitish strings of mucus that radiated out in parallel lines from the remaining curds to which they were intimately attached. There were still about ten curds an inch or more in length and from one-half to one inch in width. One was over two inches long and over one-half inch thick. All had the characteristic packed appearance and nearly all were almond-shaped. They were harder than in any other experiment. Some of them still had bizarre shapes resulting from agglutination of smaller curds. Some of them looked as if eaten into, as if holes had been digested out of them, resembling very strikingly in this respect, as in most others, the hard, beanlike, amber-colored casein curds that often occur in the stools of infants that are fed on raw milk.<sup>2</sup> *The peculiar solidness of milk is here well shown. The curd does not break up and soften in the gastric and intestinal juices, en masse, as would bread or meat for example, but gets increasingly harder and digestion takes place only on the surface, gradually melting the curd down to a smaller size.* •

#### FRESH MILK AND COOLED MILK

In all the above experiments the milk was not fresh from the cow, but had been on ice for twelve to twenty-four, or even more, hours. The following experiment would indicate that there is no essential difference between fresh milk and refrigerated milk.

EXPERIMENT 11. *Warm, fresh milk.* A pint of warm milk taken immediately after milking was returned in thirty minutes. There was no appreciable difference in any way between this result and those of Experiments 1 and 2, while the curds in general were a little smaller. This difference was not greater than the normal variations that occur in two identical experiments.

#### THE COAGULATION OF BOILED COW'S MILK

While it has been known, in a general way, that heating milk inhibits the action of rennin on milk in the test-tube, the extent

to which this is true in the stomach has not been appreciated. The following experiments with boiled milk that parallel roughly those with raw milk show this striking difference. In all of these experiments the milk was boiled for five minutes in an open vessel.

EXPERIMENT 12. *Interval thirty minutes.* One pint of whole cow's milk boiled five minutes was taken rapidly and the stomach contents returned after thirty minutes. There was quite complete separation of curds and nearly clear whey. The curds were very uniform in size. The great majority of them were the size of a small pea, a few were a little larger and the rest varied all the way down to fine sand. Fully as striking was the difference in consistency. Instead of hard and rubbery, they were soft, friable, scraggly, but rounded off and resembled very closely a finely broken up good custard. They separated quickly from the whey and fell to the bottom.

EXPERIMENT 13. *Fat-free milk. Interval thirty minutes.* Same as Experiment 12, except that 1 quart of boiled *fat-free* milk was used instead of 1 pint of whole milk. The result was exactly the same, except that the curds were whiter and the separation of curds and whey, perhaps, a little less complete. Even with fat-free milk the curds were soft and friable as compared with the hard, rubbery curds of raw *fat-free* milk.

EXPERIMENT 14. *Interval two hours.* A quart of boiled whole milk was taken rapidly and returned in two hours. There was so little whey that it was necessary to drink water to be able to return the curds. They were still very abundant, varying in size from a pea to a very small hazelnut. They were distinctly larger and firmer and more rounded off and packed than in Experiment 13.

EXPERIMENT 15. *Interval three hours.* Same as Experiment 14, but returned in three hours. It was again necessary to drink water. The returned contents were reported "bitter" and "sour." About a tablespoonful of rather soft, round curds *were* returned that were for the most part about the size of sand grains with a few as large as a small pea. A large mass of mucus with gray, feathery, stringy masses of fine milklike curds entangled in it floated on top of the water.

EXPERIMENT 16. *Interval three hours.* Same as Experiment 15, except that 1 pint of boiled whole milk was used instead of



1 quart. Water was again needed to return the stomach contents. About a dessertspoonful of rounded, packed, typical boiled milk curds *were* returned that varied in size from sand to gravel. They *were* somewhat harder than in previous experiments with boiled milk. There was about a like amount of grayish, floating mucus enmeshing fine flocculent curds as in Experiment 15.

EXPERIMENT 17. *Interval five hours.* A pint of whole boiled milk was returned after five hours. Water taken as before. There was returned one rather hard curd the size of a small navy bean, three or four much smaller ones, a little detritus, and about a half teaspoonful of fine, flocculent, floating substance.

#### THE COAGULATION OF PASTEURIZED COW'S MILK

EXPERIMENT 18. *Pasteurized Milk.* One quart of whole milk was pasteurized by heating twenty minutes at 155°F., was then cooled rapidly to 100°F., taken in five minutes and returned after thirty minutes. The result lay between that of raw milk and of boiled milk, but was much nearer the former. There was very complete separation of curds and clear whey, as with cow's milk, and the curds had all the characteristics of those of raw milk, but were a little smaller.

*Summary*—Raw cow's milk begins to coagulate in the stomach within a few minutes. The small curds formed at first coalesce with one another and form larger, evidently conglomerate and often bizarre-shaped masses. The largest curds are quite regularly formed after about two hours, when they are often four or five inches long. They then become smaller due to *peripheral digestive liquefaction*. The curds are soft at first and become progressively harder, a characteristic of all milk curds. They do not soften and disintegrate in the process of digestion, but become harder and all digestion takes place at the periphery. Even after five hours hard curds are still found quite regularly in the stomach. Mucus is found very abundantly, especially after the first half hour. The curds are slippery and covered with mucus and more or less bound together by it. After the first half hour, and especially from one hour on, there are always present masses of tangled, feathery mucus holding in its meshes fine milky particles. When placed in water these float, forming fine filmy lines, radiating away from the curds to which they are firmly attached.

At the end of half an hour the stomach contents are neither offensive nor bitter. After one hour, and even more marked after two or more hours, they have a very offensive "sour," fatty, acid odor, and there is present the "bitter" taste of peptones. But at five hours the taste was said to be both "bitter" and "sour as after taking vinegar," probably due to the return of free Hcl. This was not reported at three hours.

In the experiments up to and including one hour after ingestion of the milk, the returned fluid was manifestly largely composed of clear, straw-colored whey. After that the fluid no longer resembled whey, but was grayish and turbid.

In boiled milk the general course of things was identical with that of raw milk. The whey was, however, less definitely separated from the curd and the latter was very much finer and softer. Instead of large, rubbery masses we have here fine, soft, indefinite curds, easily friable like a good custard and at no time, even at the two-hour period of maximum size, larger than a good-sized bean.

Pasteurized milk acted like raw milk, but had a slightly smaller curd.

Experiments 1 and 13 were repeated on myself with the use of apomorphin hypodermatically. The results were identical with these, except that all curds were slightly finer—probably due to trauma following the great exertion in passing them.<sup>2</sup>

#### THE EFFECT ON COAGULATION OF THE AMOUNT OF FAT IN THE MILK

In Experiment 1 it was shown that the curds of the fat-free milk are white, very hard—almost rubbery and very large—even as early as thirty minutes after ingestion of the milk. This is in accord with laboratory and clinical observations that the whitest, hardest and largest curds are formed with fat-free milk. In Experiment 2 and others it was shown that when 4 per cent. fat was present, as in whole milk, while the curds were no smaller they were softer, yellower and the whey slightly milky. The following experiments were made with top milk and 16 per cent. cream.

EXPERIMENT 19. *Top milk. Interval thirty minutes.* The top 8 ounces, each of 2 quarts of whole raw milk, was taken rapidly and returned in thirty minutes. This contained about 13 to 14 per cent. fat. Nearly a pint was returned, that is,

approximately all that was taken. There was separation of curds and whey, but the latter was distinctly milky. The curds were yellowish, greasy looking, and were much finer, softer, more scraggly and friable than with whole milk and much more so than with fat-free milk. There were only a few curds as large as a large filbert. The appearance was that of a coarse cottage cheese, with the curds lightly bound together and very easily broken. Even after being treated with formalin the curds remained softer and lightly matted together, quite unlike the ivorylike hardness of the fat-free milk curds. All of the curds floated in the water.

EXPERIMENT 20. *Sixteen per cent. cream. Interval two hours.* One pint of 16 per cent. cream was taken rapidly and returned in two hours. The stomach contents were extremely unpleasant to return, having a very "nasty, bitter and acid" taste. Very nearly a pint of curd was returned that had almost identically the same appearance as after thirty minutes. There was comparatively little whey and water was taken to return the curds more easily. They looked like a soft, rich yellow, creamy, greasy cottage cheese, with a very strong odor of fatty acids. The curds were soft, indefinite, greasy, loosely bound together, with a small number of harder, smaller curds the size of fine gravel. After standing for a time in a quart mason jar, after treatment with formalin, the curd all rose to the top, forming a semi-solid, creamy, liquid, with an indefinitely, defined, more solid, central mass; the whole forming about a pint or a little more. *In no other experiment was there even approximately so large a mass of curd, or milk, that had apparently been influenced so little after two hours.*

EXPERIMENT 21. *Cream 16 per cent., returned in five hours.* One pint of 16 per cent. cream was taken warm, rapidly, and returned after five hours. About 4 ounces was returned with the first attempt, and about  $\frac{1}{2}$  ounce more after a drink of water. The returned contents were very offensive, with the characteristic rancid odor of fatty acids, quite identical with that of the "sour stomach" of the baby. They consisted of a slimy, thickened, coarsely granular, creamy liquid, like a thin cottage cheese, containing in addition to the finer granules some 15 or 20 larger, discrete harder curds, that varied in size from fine gravel up to one the size of a navy bean. These harder curds were identi-

cal with those of other experiments, but were somewhat yellower, and less hard. All of the solid portions, including the larger curds, rose rapidly to the top of the water on standing. There was thus much less emptying of the stomach than in any previous five-hour experiment, not because of the size of the curds, but because of the nature of the contents, *i.e.*, high fat content.

*Summary*—Thus while the curds are hard and large in proportion as the fat content of the milk is small, the curd of cream, while small, soft and friable, is, nevertheless, the most resistant to the action of the gastric juice. *The whole mass of milk stays in the stomach longer and is less changed or diminished in quantity, the richer it is in fat.* It was furthermore very difficult to take this amount of cream, and even harder to keep it down. The first attempt failed and after the difficulty in retaining the other three no further attempts seemed justifiable. All of these observations are quite in accord with clinical experience with cream in feeding babies.

#### EFFECT ON COAGULATION OF THE TEMPERATURE OF THE MILK WHEN TAKEN

In all of the experiments so far recorded the milk was taken at about body temperature, a favorable one for the rapid action of rennin. The following parallel experiments were made with milk just taken off the ice.

EXPERIMENT 22. *Cold milk. Interval two minutes.* A pint of cold, raw milk was taken rapidly and returned after two minutes. There was practically no separation of curds and whey, except that fine, soft pinhead-sized granules could be seen when the contents were spread out in a thin layer. A cake exactly like that of Experiment 3 formed after standing.

EXPERIMENT 23. *Cold milk. Interval five minutes.* Same as Experiment 22, except returned in five minutes. There is a much more nearly complete separation of curds and whey, but the latter is still turbid and greyish. The curds are much smaller—none larger than a pea—and they are softer, more even and flaky than in Experiment 4.

EXPERIMENT 24. *Cold milk. Interval fifteen minutes.* Same as Experiments 22 and 23, except returned in fifteen minutes.



There is now quite complete separation of curds and whey, the latter is straw-colored, but still somewhat turbid. The curds are small and soft, irregular in shape, with a scraggly, broken up appearance—quite uniform in size—the great majority of them varying from the size of a pea to that of a small lima bean.

EXPERIMENT 25. *Cold milk. Interval thirty minutes.* The same as Experiments 22, 23 and 24, except returned after thirty minutes. The separation of curds and whey was now even more complete. The curds were nearly all gathered into 7 masses, varying from a filbert to a walnut in size, with a small amount of curd the size of gravel. They are apparently somewhat smaller and softer than in the corresponding experiment with warm milk.

EXPERIMENT 26. *Cold milk. Interval one hour.* Same as preceding experiments, except returned in one hour. There was no apparent difference between the results here obtained and that of Experiments 5 and 6.

Thus there is apparently no essential difference in the coagulation of cold and of warm milk in the stomach, except one of delay. The cold milk coagulates more slowly until it reaches the more favorable temperature for the action of the rennin, but the final result is the same.

#### EFFECT ON COAGULATION OF TIME CONSUMED IN SWALLOWING THE MILK, *i.e.*, SIPPING, SUCKING, GULPING, ETC.

It is an old maxim that cow's milk shall not be taken rapidly—that it must not be “gulped down”; pediatrically speaking, that the baby must take at least fifteen to twenty minutes to empty its bottle. The very subject upon whom these experiments were performed was told some ten or twelve years previously, during some temporary disturbance of digestion, to take milk alone for a time and to take it a spoonful at a time and to “chew it” thoroughly before swallowing it. It was therefore of considerable interest to investigate the effect upon coagulation of slowly sipping the milk, as slowly as a baby would take it from a bottle, instead of taking it rapidly as in all the other experiments. The result was so peculiarly contrary to all expectations and traditions that a series of experiments were made before accepting it as a law rather than a coincidence.

EXPERIMENT 27. *Sipping milk over a period of forty-five minutes.* A quart of warm, raw milk was sipped slowly over a period of forty-five minutes, and returned thirty minutes later. About 1 pint of clear whey and liquid stomach contents, without bitter taste, was returned without any difficulty, and this contained one small curd! Two glasses of water were taken to facilitate the return of other curds. The water was returned, but not a single curd—a result never before obtained. For some time after this there was a “heavy feeling” under the lower end of the sternum. Five hours later, after again drinking two glasses of water, half a dozen curds were returned that were each about the size of a large almond and resembled closely those of Experiment 10, also returned after five hours.

Only one explanation was possible, incredible as it seemed at first, *i.e.*, that all of the casein had coagulated in a few curds so large that they could not be returned. In this experiment there were probably 5 or 6 such curds. The large amount of whey was further evidence, which was hardly needed, that the milk had coagulated completely, as raw milk always does. It was quite unthinkable that the curd could have passed on and the whey remained. The absence of peptones, *i.e.*, bitter taste confirmed this. The positive proof that the curd was in the stomach and could not be returned was furnished by the fact that five hours later curds were returned that were now digested down to a returnable size. In order to determine the constancy of these findings this experiment was repeated four times.

EXPERIMENT 28. Exact duplicate of Experiment 27. The result was identical, except that there were no curds after thirty minutes, nor after five hours.

EXPERIMENT 29. Same as Experiments 27 and 28, except that the milk was sipped over a period of only thirty minutes. The result was again the same, only one small curd was returned after thirty minutes. No attempt was made after five hours.

EXPERIMENT 30. Same as Experiments 27, 28 and 29, except that 1 pint was taken over a period of thirty minutes instead of 1 quart, and was returned in thirty minutes. About 8 ounces of clear, straw-colored fluid was returned, with no curds. None could be returned after five hours.

EXPERIMENT 31. Same as Experiment 30, except that a pint of milk was sipped over a period of only twenty minutes,

and returned thirty minutes later. The clear whey contained 6 or 7 curds the size of unshelled almonds. Thus with the more rapid taking of the milk curds are again appearing much as before.

Further proof that the explanation offered above for the inability to return curds after sipping was the correct one, was obtained in two ways—first, by repeating the experiments with diluted raw milk, and with boiled milk, both of which would naturally form a smaller curd than would whole milk, a curd that would probably be returnable; and, second, by duplicating the experiments, *in vitro*.

EXPERIMENT 32. *Diluted milk sipped forty-five minutes.* A mixture of 1 pint of whole raw milk and 1 pint of water was sipped, warm, over a period of forty-five minutes and returned after another thirty minutes. In the clear straw-colored whey there was a large amount of curd that was practically indistinguishable from that of Experiment 36, in which equal parts of milk and water were taken within five minutes.

EXPERIMENT 33. *Boiled milk sipped forty-five minutes.* A quart of boiled whole milk was sipped warm over a period of forty-five minutes and returned thirty minutes later. A large amount of curd was returned again practically indistinguishable from that of a former experiment in which boiled milk was taken rapidly. (See Experiments 12 and 13.)

The evidence from the laboratory was even more convincing, because it permitted ocular evidence in the beaker of what evidently goes on in the stomach itself.

EXPERIMENT 34. A glass beaker was set in a basin of water over a heater and the contents kept at a temperature of 100° to 105° F. Into this beaker was poured slowly over a period of forty-five minutes from one vessel a quart of warm, raw, fat-free cow's milk, and from another a solution of 60 grains of *chymogen* (a rennin preparation) in 1 ounce of water. The mixture was stirred gently and constantly during the period of forty-five minutes, and then for another thirty minutes after the milk and ferment had been mixed. Within a few minutes after the beginning of the experiment a fine, flocculent coagulation was apparent. These smaller curds forming continually as the experiment progressed gradually united with one another into larger curds. These larger curds in turn attached to themselves other smaller nascent curds, until at the end of the experiment the

clear whey contained only two hard, round, masses of curds, one a little larger and the other a little smaller than a golf ball. If such masses had been formed in the stomach I am sure they could not have been passed through the esophagus. Outside of the two large curds there were a few smaller ones that had failed to unite themselves to the larger ones, and suggested the smaller returned curds of Experiments 27 and 29.

In a former experiment, where a mixture of chymogen and milk was stirred constantly covering the period of coagulation, all of the curd was ultimately collected in one round ball. To exclude the possibility of coincidence Experiment 34 was repeated.

EXPERIMENT 35. Exact duplicate of Experiment 34, except that whole raw milk was used instead of fat-free milk. The coagulation was a little less rapid and the whey less clear, but the result was essentially the same as before. Practically all of the curd was collected into six round, hard balls, each about the size of a walnut, closely suggesting again the sipping experiment in which five or six small curds were returned after five hours. (See Experiment 27.)

The manner in which all this takes place is very evident as one watches the process in the beaker. If two curds are removed from the beaker and are brought in contact with one another they coalesce almost immediately, leaving no discernible line of union. The fresher the curd the quicker and the more complete the union. Thus in the last two experiments one could see two or more curds gradually predominating over the rest by uniting to themselves the smaller nascent curds as they were brought in contact in the process of stirring. Curds contract as they get older, and show less tendency to coalesce, and so the final number of large curds is determined largely by some accident of agglutination early in the experiment.

That such a coalescence of curds takes place in the stomach is evident not only from these sipping experiments, but also from the fact that in all the stomach experiments the curds grow larger for some two hours, and many of the larger ones are manifestly aggregations of smaller ones. The tendency to unite is, however, probably much less marked in the stomach than in the beaker. If one brings into contact two curds that have remained in the stomach for thirty minutes there is *relatively* little tendency for them to unite and if the interval has been much longer the



tendency to coalesce is practically lost. Earlier, however, they evidently unite readily in the stomach, because all nascent curds in an agitated mixture are small, and the larger curds can only result from a union of these smaller curds. That curds unite less readily in the stomach than in the beaker is probably due largely to the coating of mucus that is so noticeable as one attempts to pick up the slippery older curds, less so in the earlier ones. Indeed, if curds coalesced as readily in the stomach as they do in the beaker it would be hard to see how their union into one large curd could possibly be avoided, when we consider how favorable are the peristaltic movements of the stomach, as shown by the fluoroscope, for pressing all the curds together into one mass.

After observing the very close parallelism of the curd formation in the beaker and in this individual's stomach, and from prolonged observations on coagulation of milk under many conditions, I am convinced that what has been recorded here takes place in all normal stomachs.

#### MILK MODIFIERS (THAT ALL) HAVE AN INFLUENCE ON CURD FORMATION

There are a very large number of therapeutic measures that have been used extensively in infant feeding for modifying cow's milk so that it will be an acceptable food to a baby. In nearly all of these, widely differing as they may seem to be in method or purpose, the greatest apparent effect is always a *smaller* curd. Thus there are used for the same purpose boiled, diluted, alkalized and acidified, coagulated, condensed, dried and otherwise variously modified milks, together with a large number of proprietary infant foods, that nearly all claim to have some special virtue as a milk, *i.e.*, casein, modifier. In the following experiments the effect of these various measures on the coagulation of milk in the stomach has been studied, and while they have a more immediately practical bearing to the pediatricist, I venture the hope that they may be of interest also to the internist and to the physiologist.

#### DILUTION OF MILK WITH WATER

Of all the measures that have been used in adapting cow's milk to the infant the oldest and most constant is that of dilution with water. At first, wholly empirically because it was

observed that diluted milk was better borne by the infant; then rationally to reduce the 4 per cent. protein of cow's milk to somewhere near the 1.5 per cent. of human milk, so that the infant's digestion and metabolism should not be unnecessarily overtaxed; and finally, because we know that diluted milk has a finer curd than whole milk.

EXPERIMENT 36. *Diluted milk (1 to 1)*. A mixture of 1 pint each of raw whole milk and water was taken rapidly and returned in thirty minutes. There was quite complete separation of curds and whey, with the latter somewhat turbid. The curds were much smaller, softer and more friable than those of undiluted milk, although many of them were from one to one and one-half inches long, they were peculiarly thin, often membranous or ribbonlike, and nearly all of them were spongy or porous looking. There was also a large amount of fine crumbly detritus.

EXPERIMENT 37. *Diluted milk (1 to 1)*. Same as Experiment 36, except 1 pint was taken instead of 1 quart. About 12 ounces were returned. The result was the same as before, except that the curds were somewhat larger; two of them were two to three inches long, and several were the size of almond kernels. They were not quite as scraggly or ribbonlike, as in Experiment 36, but had the same spongy or porous appearance. There was a considerable amount of fine detritus, some of which floated, and some sank to the bottom.

EXPERIMENT 38. *Diluted milk (1 to 1)*. Same as Experiment 37. Result the same, except curds smaller again as in Experiment 36, with a large amount of fine, floating detritus.

EXPERIMENT 39. *Diluted milk (1 to 3)*. Eight ounces of raw whole milk and 24 ounces of water was taken warm in five minutes and returned in thirty minutes. This differed from the results in Experiments 36, 37 and 38 only in that the curds were *much* smaller, softer and were still more porous or spongy looking.

EXPERIMENT 40. *Boiled diluted milk (1 to 1)*. One pint each of whole milk boiled five minutes and 1 pint of water was taken rapidly and returned in thirty minutes. It was necessary to drink water to be able to return the contents of the stomach. About a tablespoonful of fine, soft curds was returned, about like coarse sand, as compared with gravel of undiluted boiled milk.

The *porosity* and *thinness* of the curds of diluted milk may be an important factor in their digestion, as the distances through which the digestive juices must work are relatively less than with undiluted milk. The size of the curds varies inversely as the dilution, or directly as the amount of casein. This probably explains largely the difference between the fine flocculent curd of human milk with its  $\frac{1}{2}$  per cent. casein, and the large, hard curd of cow's milk with its 3 per cent. casein.

#### THE USE OF ALKALIES, SODIUM SALTS, ETC.

Alkalies in one form or another have been used very extensively in modifying cow's milk for babies. Among all of them lime-water has easily enjoyed for many years the greatest popularity among both laymen and physicians. It has been used especially to prevent vomiting, to "sweeten" the stomach, and to influence the milk favorably, presumably by altering the casein coagulation. It is gratifying to note that a procedure that has enjoyed so many years of confidence should seem to have a rational as well as an empirical basis.

EXPERIMENT 41. *Lime-water 5 per cent., the strength commonly used.* To 30 ounces of raw whole milk  $1\frac{1}{2}$  ounces of lime-water was added, the mixture was taken warm rapidly and returned in thirty minutes. There was complete separation of curds and whey, but the latter was quite milky. The curds were about midway in size between those of raw and of boiled milk, but were peculiarly thin, scraggly and handlike, and were so porous, soft and friable that they could hardly be picked up without breaking.

EXPERIMENT 42. *Lime-water 10 per cent., otherwise the same as Experiment 41.* The result was the same, except that the curds were still smaller and were even more ribbonlike or flaky, more porous, soft and friable than when only 5 per cent. was used. Subjectively they are described as "the softest yet." and the returned stomach contents were said to have "a very sweet taste," that was present in no other experiment.

The curd of milk to which lime-water has been added would thus seem, on account of its thin, ribbonlike, porous character, to be a peculiarly favorable one for the action of the digestive juices,

## SODIUM SALTS

Sodium citrate has been used very extensively by British, and more recently also by American pediatricists, because of its inhibitory action on casein coagulation. To obtain the maximum effect it is customary to add 2 grains to each ounce of milk in the mixture, while lesser amounts are often used for a less decided effect. That there is a rational basis for the use of sodium citrate in the dosage here given is seen in the following experiments:

EXPERIMENT 43. *Sodium citrate, 2 grains to each ounce of milk.* Sixty-four grains of sodium citrate were added to 1 quart of raw, fat-free milk; the mixture was taken rapidly and returned in thirty minutes. There was practically no separation of curds and whey even after standing for some time longer. The milk was simply thickened resembling a good cream soup, with no distinguishable curd formation, except scattered small, soft, flocules. The mixture was not unpleasant to take, nor to return.

EXPERIMENT 44. *Sodium citrate, 1 grain to each ounce,* was added to 1 quart of raw whole milk, the mixture taken rapidly and the contents returned after thirty minutes. The returned whey looked like pale-bluish milk, and the curds were soft, scraggly looking and in size and consistency about midway between those of raw and those of boiled milk.

EXPERIMENT 45. *Sodium citrate and diluted milk.* One grain of sodium citrate to each ounce of milk, that is, 16 grains in a mixture of 1 pint of raw whole milk and 1 pint of water, were taken warm and returned in one hour. The separation of curds and whey was much more complete than in the two preceding experiments, probably because of the longer sojourn in the stomach. The curds were, however, much finer than in Experiment 44, were about the size of coarse sand or fine gravel, and nearly all floated. The result was practically the same as in Experiment 40, with equal parts of boiled milk and water.

EXPERIMENT 46. *Sodium citrate, 2 grains to the ounce of milk, returned in two hours.* Thirty-two grains of sodium citrate were added to a pint of milk, the mixture was taken rapidly and returned in two hours. It was necessary to drink water to return the stomach contents, that looked like a pale, thickened milk,



The larger part of the curd very slowly collected at the top of the water in a thick, milklike layer of about 2 to 3 ounces in which curdling was barely perceptible. This layer is apparently held together by mucus and has the slimy consistency of thick barley water. Separate from this and heavier than water, there is about one-fourth of an ounce of hard curd. Most of this is like fine gravel, two curds were about the size of a bean, and one bizzare aggregation was one and one-half inches long, one inch wide and one-quarter inch thick.

Sodium citrate is thus shown to have a very marked influence on casein coagulation, both delaying and altering it. This probably explains its decided therapeutic effect in infant feeding, where it is seen to allay vomiting, to cause hard curds to disappear from the stools, to lessen colic and indigestion. While a few larger curds separate out after two hours in the stomach, here as everywhere apparently the time for maximum curd formation, nevertheless much the larger portion of the casein is barely coagulated at all. It is assumed that when sodium citrate is added to milk the normal soluble *calcium* caseinate is changed to sodium caseinate. When this is acted on by rennin, soluble sodium paracaseinate is formed, instead of the insoluble calcium paracaseinate when milk alone is acted upon by rennin. Just why a few larger curds form later, requires explanation, but is of little practical value.

EXPERIMENT 47. *Sodium bicarbonate.* Two grains to the ounce of milk. Sixty-four grains of sodium bicarbonate were added to 1 quart of milk. The mixture was so nauseating, and so hard to take on account of the violent eructations of gas and the disagreeable taste of the "soda" that it was impossible to take more than 28 ounces. A very annoying belching of gas, often accompanied by milk, together with a feeling of fullness in the stomach persisted for some time. No other experiment was accompanied by anything approximating the discomfort and disagreeableness of this one. The effect upon coagulation was indistinguishable from that of a like amount of sodium citrate.

#### MILK OF MAGNESIA

This has been warmly advocated both as an antacid and as an inhibitor of casein coagulation, to be used in the strength of one teaspoonful to the pint of milk.

EXPERIMENT 48. *Milk of magnesia.* A teaspoonful of Phillip's milk of magnesia was added to 1 pint of raw whole milk at night, was taken rapidly the next morning and the stomach contents returned in thirty minutes. The returned fluid was about the consistency of a good cream soup. The milk was slightly thickened, but there was practically no perceptible curd formation, nor was there any sensation of grittiness or curdiness as it was returned. The effect was fully as great as with 2 grains of sodium citrate to each ounce of milk and was quite indistinguishable from it.

EXPERIMENT 49. *Milk of magnesia.* Same as Experiment 48, except was returned in two hours and was taken shortly after mixing, not after standing over night. It was necessary to drink a glass of water before returning the contents. The result was very similar to that of Experiment 46, in which 2 grains of sodium citrate were added to each ounce of milk, and returned in two hours. There was the same slimy homogeneous floating mass of about 2 ounces that contained about one-half of all the curds. This mass was, however, distinctly more granular, was more made up of larger fine curds than was the citrated milk. At the bottom of the water there was a small layer of curds of irregular size, varying from fine sand up to one the size of an unshelled almond. All were ragged but quite firm. They again resemble the heavier curds of the citrated milk or the curd of boiled milk, returned after two hours.

The action of alkalies and of salts like sodium citrate on casein coagulation in the stomach is not perfectly clear. In the case of alkalies like magnesium hydroxide (milk of magnesia), or sodium bicarbonate, the predominating action is probably one of neutralization of the hydrochloric acid that is necessary for rennin coagulation. The neutralization of other acids in the stomach, as well as of the lactic acid of the milk itself, probably also plays a part. The sodium citrate, on the other hand, is assumed to act primarily on the lime salts contained in the milk, as stated before, and only very secondarily as a weak antacid by reacting with hydrochloric acid to a limited extent forming citric acid, which is a weaker acid than hydrochloric acid and thus reduces the total acidity. The true alkalies cannot then be expected to have the same action as sodium citrate, grain per grain. It can readily be understood that a given amount of an active alkali such as magnesium hydroxide will have a much

greater effect on casein coagulation, because of its greater neutralizing power on the hydrochloric acid of the stomach, than will a like amount of sodium citrate acting primarily on the very large amount of calcium salts in cow's milk, and only very secondarily, if at all, as an antacid. Thus, while a teaspoonful of milk of magnesia contains only about 3 grains of magnesium oxide in the form of a hydroxide, it is claimed to be the antacid equivalent of 15 grains of sodium bicarbonate, or 30 grains of sodium citrate or 8 ounces of lime water. This claim seems fully warranted from the foregoing experiments, and is doubtless due to the well-known, strong, immediate affinity for acids common to hydroxides, as compared with salts, such as the carbonates and citrates.

#### PRECOAGULATED MILK

Pediatricians, again, in feeding babies with gastrointestinal disturbances have had a great fondness for milk that has been coagulated, then finely divided by agitation, and taken in this finely divided state. This coagulation is brought about either by acids, from lactic acid forming bacilli, as in buttermilk, or acidified milk; or by the use of a rennin ferment, such as the well-known German preparation, pegin; or by both of these processes, as in Finkelstein's *Eirweissmilch*. It has been shown that the larger curds that form in the stomach are a union of smaller curds. It was of interest then to ascertain whether such finely divided coagula, as we have in precoagulated milk, remain such in the stomach, or recollect into larger masses.

#### BUTTERMILK. ACIDIFIED MILK

As a representation of this class Walker Gordon's "*ripened milk*" acidified with *Bacillus Bulgaricus* and containing about 1 per cent. fat was used.

EXPERIMENT 50. *Acidified milk*. One pint of ripened milk was taken rapidly and about 10 ounces returned in one hour. There was no perceptible change in consistency, but it was reported "sourer up than down."

EXPERIMENT 51. *Acidified milk*. Interval two hours. One pint of acidified milk was taken rapidly and the stomach emptied after two hours. Only a small amount of homogenous milklike

substance returned with practically no curds. The stomach was apparently very nearly empty.

With no increased curd formation after one hour, and practically no curds after two hours, it would seem safe to assume that acidified milk does not recoagulate to any extent in the stomach.

#### MILK PRECOAGULATED WITH RENNIN

This procedure, in which sweet milk is coagulated with rennin, then agitated so that the curd is finely divided, has had considerable vogue among German pediatricians and to some extent in this country.

EXPERIMENT 52. *Boiled milk with pegin.* One pint of whole milk was boiled five minutes in a single boiler, then cooled to 104°F., and 30 grains of pegin (rennin 11.1 per cent., lactose 88.9 per cent.) was added in solution. This mixture was allowed to stand ten minutes till finely coagulated. It was then shaken thoroughly in a Mason jar till all of the curd was finely broken up, and was placed on ice for nine hours. Before taking the mixture it was again shaken thoroughly, and the resulting smooth, slightly thickened milk was taken warm and returned in thirty minutes. About 12 ounces were returned. There was fairly complete separation of curds and whey, but the latter was quite milky. The curds were very fine and soft, very uniform in size, and settled for the greater part as a fine sand at the bottom of the fluid. Only a few curds were up to the size of a half lentil. They were much smaller and softer than with plain milk boiled five minutes. About a tablespoonful of curd so fine that individual curds could hardly be recognized floated on top of the whey as a thick, slimy layer.

EXPERIMENT 53. *Raw milk with pegin.* Exact duplicate of Experiment 52, substituting raw milk for boiled milk. After the period of standing for nine hours there was still not very complete separation of curds and whey. The curds were largely gathered into a soft, easily divisible cake that again broke up very readily into fine, soft curds when shaken. In the returned stomach contents there was fairly complete separation of curds and whey. The curds were much larger than with boiled milk and pegin, but were still finer than with plain boiled milk. (Experiments 12 and 13.) They were quite uniform in size,



like a coarse sand or a very fine gravel, but less uniform than either plain boiled milk or boiled milk with pepsin. Many of the curds were the size of a pea, or small bean, and one or two were as large as a lima bean. They were peculiarly soft and mushy, irregular and scraggly looking, having no resemblance to raw milk curds. A very fine layer again separated out at the top, as in Experiment 52, leaving a layer of slightly turbid, straw-colored whey between this and the thicker layer beneath.

EXPERIMENT 54. Raw milk with pepsin. Same as Experiment 53, but returned in one hour instead of thirty minutes. Most of the curd is in the form of fine, flocculent, floating, soft curds, with only a few hard curds, perhaps a half teaspoonful altogether, that sink to the bottom, and only a few of which are up to a pea in size.

There is thus apparently no increase in size of curds after one hour as compared with thirty minutes, although the comparatively small amount of curd returned leaves it a little indefinite whether a considerable amount had either passed on or for some reason was not returned. It would appear that there is very little tendency for curds to reform in the stomach to any extent after the milk had been pre-coagulated with rennin, although a little more so than with acidified milk. There is thus a very rational basis for the use of milk pre-coagulated either with acids or with rennin whenever a fine, soft curd is desired, as in infant feeding, or in the feeding of cases of typhoid, ilio-colitis, gastric or duodenal ulcers, and elsewhere.

EXPERIMENT 55. *Eiweissmilch* (*Finkelstein*). One pint of *eiweissmilch* (a mixture of 1 pint of buttermilk and the curd of 1 quart of whole raw milk, precipitated by rennin and rubbed several times through a fine sieve, with water added up to 1 liter) was taken warm, rapidly, and returned in thirty minutes. There was no appreciable change, except for the admixture of mucus with the returned fluid so that it was said to be "granular down and slimy up." A finely granular layer separated out and fell to the bottom, leaving a broader, somewhat turbid layer above—just as happens when *eiweissmilch* stands for a time. Thus in this mixture, which combines milk acted upon by acids, and the finely divided curd of milk acted upon by rennin, there is, as in buttermilk alone, practically no tendency to the reformation of curds in the stomach.

## CONDENSED AND DRIED MILKS

In these preparations the milk is evaporated either to a thick syrup or to a powder, and carbohydrates are added. As is well known, they are very easy to digest and, on account of the high sugar content, are very fattening. They are therefore used to an enormous extent by the laity for feeding babies, and to some extent by physicians as a temporary, easily-digested food, for an infant that cannot adequately digest fresh cow's milk for the time being. The following were chosen because they represent types and also because their great popularity makes them especially interesting for this purpose:

Borden's Eagle Brand Condensed Milk, which is milk evaporated to one-fourth of its volume with the addition of cane sugar up to a total sugar content of nearly 55 per cent.; Horlick's Malted Milk, a dried cow's milk with the addition of dextrin and maltose from freshly malted barley up to a total carbohydrate content of 67.95 per cent; Nestlé's Food, a dried milk with the addition of cane sugar, 25 per cent., and dextrin and maltose, 27.36 per cent., making a total of nearly 59 per cent. carbohydrate; Mammala, a French powdered milk preparation, in which the cow's milk is partly skimmed, then evaporated to dryness by the Hatmaker Process, in which the milk is "exposed for less than two seconds in a very thin film upon a drying surface, heated above 280°F.," with the further addition of milk sugar up to a total of about 55 per cent. The protein content is approximately as follows: Condensed milk, 8 per cent.; Horlick's Malted Milk, 16.35 per cent.; Nestlé's Food, 14.34 per cent.; Mammala, 24.35 per cent. These preparations are all alike in that they have been heated to varying degrees of dryness, and have all been supplemented by sugars, and in some cases dextrins as well.

In each of these experiments the food was made up according to the directions for an infant of three months.

EXPERIMENT 56. *Condensed milk.* Three ounces of Borden's Eagle Brand Condensed Milk was added to 30 ounces of water, was taken rapidly and returned in thirty minutes. The curd was an almost imperceptible, very minute, soft, flocculent, precipitate that separated from a nearly equal amount of almost clear water, and settled to the bottom as a very fine, white, sand-like sediment.

EXPERIMENT 57. *Condensed milk*. Same as Experiment 56, except returned in one hour, and only 1 pint used. Result much the same. There was relatively less curd and it was even finer and more homogeneous, except that it contained a few indefinite, shreddy, membranelike, soft curds that are larger than in the preceding experiment. The main curd that resembled a colloid substance, all collected at the top instead of at the bottom of the water.

EXPERIMENT 58. *Horlick's Malted Milk*. Ten heaping teaspoonfuls of Horlick's Malted Milk were added to 1 pint of water, taken rapidly and returned in one hour. About 8 ounces were returned. The fluid was somewhat thickened, and only closest scrutiny could make out that it was made up of minutest, soft flocculent curds that gradually formed a fine sediment at the bottom, leaving almost an equal amount of clear brownish liquid above.

EXPERIMENT 59. *Nestlé's Food*. Five level tablespoonfuls of Nestlé's Food were added to 16 ounces of water, taken rapidly and returned in one hour. The result was indistinguishable from that of Experiment 58. The curdling was barely perceptible. A very fine sediment settled to the bottom, leaving a clear, brownish layer above.

EXPERIMENT 60. *Mammala*. Fifteen heaping teaspoonfuls of Mammala were dissolved in 500 c.c. of water at a temperature of 125°F. were taken rapidly and returned in one hour. Only a few small curds were returned at first. After a drink of water a few more were returned, and there was a sensation of a large mass in the lower end of the esophagus. This apparently was not returned after another drink of water, but about a heaping tablespoonful of smaller curds was returned. These differed materially from the curds of any other experiment, except those in which Mammala was used. They seemed round, packed or rolled, hard, dry, crumbly, like dried putty. They varied in size from fine granular sand, through gravel up to one the size and shape of an unshelled almond. Because of its peculiar hardness and dryness this may have been the curd that lay for a time in the lower end of the esophagus, although it is quite possible that there was a still larger one that could not be returned. The curds were quite yellow in color, and even the fluid was tinged with yellow.

This result was so different from the strikingly uniform result obtained with all the other dried or condensed milks, that the experiment was repeated as follows:

EXPERIMENT 61. *Mammala*. Three ounces by weight (equivalent to fifteen heaping teaspoonfuls) of Mammala were dissolved in 500 c.c. of water at a temperature of 125°F., the mixture was taken rapidly and returned in one hour. The result was exactly the same as in the preceding experiment with Mammala, minus the sensation of a large mass in the esophagus. There was a slightly larger amount of curd of the same size, shape and hardness.

The explanation for this striking difference in the coagulation of Mammala and of condensed milk is not evident. The one that first suggests itself is that Mammala contains over three times as much protein, hence also casein, as does condensed milk; furthermore, about twice as much Mammala as condensed milk was used; and in the coagulation of fresh milk the size of the curd varies directly with the percentage of casein. That this explanation is not alone sufficient, is evident from the following experiment, in which the dilution in each case was such that the amount of cow's milk protein was approximately the same in each, that is, about 2 per cent.

EXPERIMENT 62. *Condensed milk*. Four ounces of Eagle Brand Condensed Milk were added to 15 ounces of water. The mixture was taken rapidly and returned in one hour. About 2 to 3 ounces of curd were returned and gradually sank to the bottom. The curds were soft and flocculent, slightly larger and more distinct than in the previous experiments with condensed milk (Experiments 56 and 57) in which the dilution was greater. They were characteristically uniform in size and like a moderately coarse sand, but not a single curd was larger than a large grain of sand.

EXPERIMENT 63. *Mammala*. One and one-third ounces, by weight, of Mammala were added to 16 ounces of water. This was taken rapidly and returned in one hour. About one-fourth of an ounce of small, round and oblong typical curds, as in previous experiments with Mammala, were returned, varying in size from that of sand up to that of a navy bean. There was, in addition, about half an ounce of shaggy, flocculent material, loosely matted together.



EXPERIMENT 64. *Mammala*. Duplicate of Experiment 63, but returned in two hours. Two or three typical hard, dry Mammala curds, up to large navy bean size were returned. The rest of the curd, nearly an ounce in volume, was collected into large, shaggy, feathery semifloating masses.

While the curds approached one another in size from both directions, as the amount of casein was made approximately the same, nevertheless they were still characteristically different. That the difference is not due to the fact that Mammala contains a large amount of milk sugar, and condensed milk a large amount of cane sugar, is evident from a later experiment, in which it is shown that cane sugar has little, if any, influence on coagulation. The difference in the method of evaporation, low and prolonged heat, in the case of condensed milk and all the other dried milks here listed, on the one hand, and very high short heat in the case of Mammala, suggests itself as a further explanation, as does also the fact that in Mammala some of the cream has been removed.

#### THE INFLUENCE OF STARCH, DEXTRIN AND SUGARS ON COAGULATION

For many years it has been taught that dilution with cereal concoctions, like barley-water, acts favorably on cow's milk as an infant food by preventing the formation of large curds in the stomach. The same has been claimed for partially converted starch or dextrin. It has even been maintained that maltose has a similar action. These claims have found very extensive practical expression in the manufacture and advertisement of a variety of popular "infant foods" that are used with fresh milk. The effect on coagulation of starches, dextrans and sugars, especially maltose, can perhaps best be investigated by observing the effect on coagulation of these "foods," the composition of which is quite definitely known. This will give us an opportunity at the same time not only to investigate the effect of the starch, dextrans, etc., but also to see how these "foods" act as "milk modifiers," and this will be of interest to the pediatricist at least.

As typical representatives of these foods, the following were used: Robinson's Patent Barley Flour, containing nearly 75 per cent. of starch; Eskay's Food, containing nearly 30 per cent. of starch, 1.7 per cent. of dextrin, and about 54 per cent. of lactose; and Mellin's Food that contains no starch, but about 80 per cent.

of soluble carbohydrate, of which approximately 20 per cent. are dextrans and 60 per cent. maltose.

EXPERIMENT 65. *Barley flour.* One-half ounce, by weight, of Robinson's Patent Barley Flour was boiled in a single boiler for twenty minutes, in 1 pint of water, and at the end of the boiling, water was added up to 1 pint to make up for evaporation. To this pint of barley-water was added 1 pint of raw whole milk, the mixture was taken rapidly and returned in thirty minutes. The curds were very small, like very fine gravel, of peculiarly uniform size, with only an occasional curd as large as a small pea. They were very soft, shreddy or scraggly, porous and of a greenish-gray color. About one-third of them floated. They were very much finer than those in which an equal or treble amount of water was used as diluent in place of the barley-water; in fact, they in no way resembled them. They had much more nearly the size and consistency of boiled milk curds.

This experiment was repeated with a larger interval to see whether there was the usual tendency to form larger curds, as the milk remained in the stomach for a longer time.

EXPERIMENT 66. *Barley flour.* Same as Experiment 65, except that only 1 pint was used and that returned in one hour. The greater part of the curd settled to the bottom as about 3 ounces of a finely, flocculent, homogeneous, somewhat gelatinous mass that resembled cooked starch in which individual curds could hardly be made out. About two teaspoonfuls of hard, distinctly heavier curds separated from this mass, varying in size from coarse sand to fine gravel. A few of the curds were somewhat larger than in Experiment 65, when returned after thirty minutes, but the largest was only the size of a large pea.

EXPERIMENT 67. *Eskay's Food.* Two and one-half rounding tablespoonfuls of Eskay's Food was boiled in 1 pint of water for fifteen minutes, cooled, and to 8 ounces of this was added 8 ounces of raw whole milk. This was taken rapidly and returned in thirty minutes. The curds were almost exactly like those of Experiments 65 and 66, in which equal parts of raw milk and barley-water were used. They had the same scraggly, shreddy, porous appearance, the same grayish color, and were about the same size and were equally uniform in size.

EXPERIMENT 68. *Mellin's Food.* Three level tablespoonfuls of Mellin's Food in 8 ounces of water was mixed with 8 ounces

of cold raw milk. This was taken warm rapidly and returned in thirty minutes. Nearly 8 ounces were returned. The curds were very fine, of very uniform size, like finest gravel or very coarse sand, the largest the size of a pea. They were shreddy and porous looking, and of a grayish-brown color. They settled to the bottom of the brownish, clear liquid as a soft, coarse sediment. The curds again resembled very closely those of equal parts of barley-water and milk or of Eskay's Food, but were possibly a little finer.

EXPERIMENT 69. *Mellin's Food*. Duplicate of Experiment 68. Result exactly the same.

It is interesting to speculate why three such different preparations should all lead to the same fine curd—a curd very much finer than with an equal dilution with water. In the case of the barley-water it is the starch alone that can cause this and that the starch has such an effect has long been taught. Starch on boiling forms a colloidal substance that it is assumed prevents mechanically the formation of large curds. It would seem a more exact statement that the presence of the colloidal substance in, or about, the small curds that are first formed prevents that agglutination of smaller curds into larger ones that is so conspicuous a feature in the coagulation of straight milk or of milk diluted with water. Hence the curds remain small, even after one hour in the stomach.

The presence of an almost exactly equal amount of starch in the Eskay's Food mixture as here prepared, and in the barley-water mixture, is sufficient explanation for the striking resemblance of the curds.

In Mellin's Food, however, there is no starch and an explanation for the fine curds must be sought either in the dextrin-maltose content or in some other ingredient. Dextrins and maltose are soluble carbohydrates, and this leads to the question whether these non-colloid-forming carbohydrates can have a starch-like effect on coagulation. The following experiments were made with cane sugar and with maltose (Merck's C. P.), the mixture being otherwise the same as in the experiments with Mellin's. That the milk sugar has no effect on coagulation would seem to be evident from the coagulation behavior of Mammala alone, with its high milk sugar content.

EXPERIMENT 70. *Cane sugar*. Three level tablespoonfuls of cane sugar were added to 8 ounces each of raw whole milk and of water, the mixture was taken rapidly and returned in thirty minutes. There was complete separation of curds and whey as in raw milk watery dilutions. The curds have no resemblance in any way to those in which a cereal concoction was used as a diluent. There were at least four curds the size of an unshelled almond, and a number of them as large as an almond kernel. The rest varied all the way from this down to fine gravel. The curds were fully as large, or a little larger, and denser, more rounded and less porous and ribbonlike than in Experiment 36, and resembled very closely those of Experiment 37, in both of which there was simply equal parts of raw milk and water.

EXPERIMENT 71. *Maltose (Merck's C. P.)*. Duplicate of Experiments 68, 69 and 70, except that maltose was used in place of Mellin's, or cane sugar. The result was practically the same as when simply equal parts of milk and water were used, or when cane sugar was added, except that the whey was faintly brownish. One curd was the size of an unshelled almond, and five or six were the size of an almond kernel. Thus, with a considerably larger amount of maltose than in the experiments with Mellin's the curd was quite uninfluenced.

It would thus seem that milk sugar, cane sugar and chemically pure maltose have no appreciable influence on the coagulation of milk in the stomach. That dextrins likewise have little, if any, effect is evident from the following duplication of these experiments, substituting other dextrin-maltose preparations that contain a much greater amount of dextrin and less maltose than Mellin's, for Mellin's, and yet have no appreciable effect on curd formation.

EXPERIMENT 72. *Mead's dextri-maltose*. Duplicate of Experiment 68, using Mead's dextri-maltose instead of Mellin's Food. This preparation is said to contain over twice as much dextrin and about four-fifths as much maltose as Mellin's. The fluid returned was of a faint brownish color. The curds were grayish in color and resembled somewhat those of Mellin's, but were much larger and not at all uniform in size—varying from fine gravel up to one the size of a small unshelled almond. They had, in general, the size and the scraggly and porous appearance of the curds of watery dilutions of milk.



EXPERIMENT 73. *Soxlet's Nährzucker*. Duplicate of Experiment 68, using Nährzucker in place of Mellin's Food. This preparation is stated by the manufacturers to "contain maltose and dextrin in approximately equal shares," *i.e.*, nearly two and one-half times as much dextrin, and about one-fourth less maltose than Mellin's. Neither of these ingredients, nor any other, had any appreciable influence on the coagulation of the milk. The fluid was not brownish, the curds were not gray, and they were not uniform in size. They in no way resembled the curds of Mellin's, but were quite like those of equal parts of raw milk and water and were fully as large. At least eight or nine curds were the size of large almond kernels, the rest varied all the way down to coarse sand. It would seem from this that dextrin has no decided influence, if any, on coagulation—since the amount of dextrin here used is more than twice as great as that of Mellin's, and is nearly twice as great as the amount of starch used in the barley-water experiment. (Experiments 65 and 66.)

With the dextrin and maltose eliminated it is interesting to seek farther for the factor that determines the formation of the fine curd in the use of Mellin's Food. One might turn to the fact that Mellin's contains over 10 *per cent.* protein as compared with much less than 1 *per cent.* in the case of both Mead's dextri-maltose and Nährzucker or to a difference in manufacture, upon which much stress is laid. A more satisfactory explanation, however, would seem to lie in the salts. Mellin's contains 4.21 *per cent.* salts, excluding sodium chloride, while dextri-maltose and Nährzucker respectively contain approximately 0.4 *per cent.* and 0.85 *per cent.*, excluding sodium chloride. According to the statement of the manufacturers, Mellin's contains 2.536 *per cent.* of potassium bicarbonate, to say nothing of 0.897 *per cent.* potassium phosphate, .383 *per cent.* potassium sulphate, etc. In the mixture of 8 ounces of milk and 8 ounces of water with three level tablespoonfuls of Mellin's Food, the potassium bicarbonate alone would amount to approximately 1 grain to each ounce of milk in the mixture. This alone should make the resulting curd similar to that of Experiment 45, in which 1 grain of sodium citrate was added to each ounce of milk in a mixture of equal parts of milk and water. That it does this is evident from a comparison of the descriptions of the curds resulting in each case.

This explanation is also corroborated in the following experiments. We have seen that the curd with a cereal water dilution (barley flour, Experiments 65 and 66) does not increase materially in size in the stomach. We have seen, on the other hand, that some of the curds, when sodium citrate or milk of magnesia is added to the milk, increase in size up to one or two hours (see Experiments 46 and 49) after ingestion. The reaction in the following experiment in which the Mellin's Food mixture is retained longer in the stomach is quite identical with these.

EXPERIMENT 74. *Mellin's*. Same as Experiment 68, except returned in one hour instead of thirty minutes. The curds are not as uniform as before, many are finer than after thirty minutes, some are of about the same size, and a few are much larger. One curd was one and one-quarter inches long, three-quarters inch wide, and three-eighths of an inch thick. Several more were the size of a large bean. Otherwise the result was as in Experiment 68.

*From all of this it seems safe to conclude that starch concoctions very radically influence the coagulation of milk in the stomach, and that the soluble carbohydrates, dextrins, milk sugar, cane sugar and maltose have no appreciable influence.*

Finally, I cannot deny myself a therapeutic digression. In feeding babies, certain foods have quite universally been recognized as easily digested by both the well and the dyspeptic infant. These are human milk, diluted milk, boiled milk, condensed milk and dried or powdered milk; milk that has been pre-coagulated with acids, as in buttermilk; with rennin, as in the case of pegginn, or with both, as in eiweissmilch (Finkelstein); milk treated with alkalies, such as sodium salts, milk of magnesia, lime-water, etc.; malt soup; milk diluted with cereal water; peptonized milk. All of these have one thing only in common, they all form a fine curd in the stomach. It is hard to escape the conclusion that this fine curd is a therapeutic desideratum. It would be hard to explain otherwise the almost equal enthusiasm with which the same clinician will use for the same case as opposed foods as acidified and alkalized milks, or condensed milk and eiweissmilch. Add to this one striking kinship of all these foods the further fact that the outstanding difference between cow's milk and human milk is in the amount and consequent coagulability of the casein, 3 per cent. in the former as compared with 0.5 per

cent. in the latter, and it would again seem that the burden of proof lies with those clinicians who have in recent years maintained so insistently that cow's milk casein offers no greater difficulties in digestion and assimilation than does human milk casein, with its almost imperceptible curd.

#### CONCLUSIONS

(1) Cow's milk coagulates in the human stomach within a few minutes. The small curds formed at first, increase in size, for about two hours, by coalescing with their neighbors, after which they decrease because of the peripheral digestive action of the gastric juice, *but are still present after five hours.*

(2) The curds of raw milk are very large and hard, and those of boiled milk small and soft; those of pasteurized milk between these, but almost like those of raw milk, *i.e., raw milk is a very solid food—boiled milk a semi-liquid food.*

(3) The less the fat in the milk the harder and larger the curd, the more the fat, the smaller and softer the curd.

(4) The greater the amount of fat the longer the stay in the stomach, and the slower the digestion.

(5) *Milk taken very slowly forms a larger curd than when taken rapidly.*

(6) The greater the dilution with water the finer, flakier and more porous the curd.

(7) Alkalies and sodium salts very greatly inhibit coagulation—even stop it completely if in sufficient amounts.

(8) Precoagulated milk, such as buttermilk, pegin milk or eiweissmilch, show very little tendency to recoagulation.

(9) Dried and condensed milks, as a rule, form a minimum curd.

(10) Starchy decoctions, such as barley-water, have a very decided influence in lessening the size of the curd, much more so than simple watery dilution.

(11) Soluble carbohydrates, such as dextrins and sugars (milk, cane and malt) have apparently no appreciable influence on the curd.

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## IMMEDIATE TONSILLECTOMY IN INCIPIENT ACUTE ENDOCARDITIS OF TONSILLAR ORIGIN \*

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It is not the object of this paper to deal with acute endocarditis in all its phases, but rather to call attention to that type of infection or, perhaps better, to that stage of infection that occurs most commonly in children in whom there has previously been no detectable lesion of the heart.

Most text books and treatises on heart diseases divide endocarditis into definite types, depending essentially upon the clinical picture or ultimate outcome of the disease. It is exceedingly questionable as to whether or not this is justifiable, any more than it is desirable to divide scarlet fever or measles into distinct types, aside from recognizing them to vary in severity.

The lesion, like all infections, represents an effort on the part of the invaded host to react to the invading organism, and whether this will be simple or malignant, to use commonly employed terms, depends upon the strain of organism and the resistance of the individual. That endocarditis is a very common lesion of childhood is amply verified by the enormous number of cases of chronic valvular defects that are constantly being encountered. That it is a condition that is rarely met with in its incipency is furthermore proved by the very small percentage of parents that are aware of preëxisting heart disturbances in their children.

There can be but one solution of this unfortunate condition of affairs. Whereas some cases of acute endocardial involvement unquestionably occur in children suffering from mild infections of the nose and throat, who have not been seen by medical men, the vast majority of these unfortunate cases occurs in children who have been attended medically, and the heart involvement not discovered simply because the stethoscope was either not used at all or used on the first examination and an apparently normal heart precluded the necessity of further auscultation.

It is probably not necessary to elaborate on the universally recognized opinion that acute endocarditis is always the result of a bacterial infection. Whether this infection is recognized at

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the time or not makes no difference; at some point bacteria have invaded the body and infected the heart valve. Whether this infection has taken place by contiguous involvement of the cusps of the valves as the infected blood passes over them, or whether the involvement occurs as the result of bacterial emboli entering the small capillaries of the heart, is rather difficult to say. Most authorities, however, are of the opinion now that the infection is embolic. This opinion is based essentially upon the large number of bacterial emboli that have been produced in animals. In this country probably no man's work stands out more prominently in this particular than that of Rosenow. Whether the members of the medical profession are prone to agree with all of his bacteriological findings, or whether they prefer to fortify themselves behind the bulwark of skepticism, incredulity and doubt that have always welcomed revolutionary ideas is immaterial as far as the ultimate pathology of his experimental endocarditis is concerned. Rosenow's results in producing typical acute endocarditis in animals have been so certain and numerous that one may question many of his theories without being able to doubt that the experimental heart lesions have been the result of bacterial invasion. Admitting this, we are confronted with the question as to what particular conditions render the body susceptible to acute inflammation of the heart valve. If one recognizes that acute endocardial inflammation is always bacterial, he is immediately confronted with the fact that it must always be secondary. Bacteria do not and can not enter the blood stream through healthy tissue, either skin or mucous membrane. It necessitates always the presence of some unhealthy primary focus. If one consults the authorities in an effort to determine the more common causes of acute endocarditis, one is immediately struck by the fact that they are exceedingly variable, but if one goes into the matter more carefully in an effort to gather data on the relative frequency of the various etiological agents, he is immediately struck by the infrequency of endocardial involvement in the so-called acute infectious diseases—scarlet fever, diphtheria, pertussis, measles, pneumonia, varicella, typhoid fever and cerebral spinal meningitis. Without quoting statistics, it is perhaps only necessary for everyone to look up the records of his own cases to definitely decide that the incidence of endocarditis occurring in the course of the ordinary acute infections is not great.

One might expect that surgical suppurative lesions should play an enormous etiological influence in producing lesions of the heart valves. In no conditions are virulent bacteria in closer contact with the blood stream than in suppurative appendicitis or osteomyelitis, and yet most surgeons will agree that acute endocarditis occurs rarely in the course of acute surgical lesions.

In what group of cases then is endocarditis most commonly found? The answer to this question is not at all difficult. The ravages of rheumatism and the allied conditions are too well known to warrant much elaboration. The only question that does arise in this connection, however, is the position that rheumatism itself will eventually hold as a clinical entity. The name has been frightfully abused. Originally derived from the Greek, a flux, it evidently impressed itself primarily upon the earlier medical men as a condition in which effusion into the joints was the essential manifestation of the disease, hence the name. At the present time the conception has changed materially. Osler and McCrae, in enumerating the causes of endocarditis, state that it is frequently associated with the following infections of the rheumatic group—tonsillitis, arthritis, chorea, erythema nodosum. Articular rheumatism is now generally conceded to be an infection. As to the infecting organism some doubt exists, but most medical men, in view of the work that has been done on the subject, agree that it probably belongs to the streptococci group. The so-called allied rheumatic infections have been so termed because they have been so conspicuously present either in children who have subsequently developed rheumatism or in patients who have already had rheumatism. If the work of Rosenow is correct, is it not more likely that what is ordinarily known as acute articular rheumatism is just one phase of a certain type of streptococcic infection, of which chorea, tonsillitis, endocarditis and erythema nodosum are other phases, symptoms or manifestations? It must be conceded that typical so-called articular rheumatism is relatively rare in children under ten years of age, and is almost never seen under five years. Some joint involvement does occur, but the typical polyarticular disease is exceedingly uncommon. On the other hand, tonsillitis, chorea and endocarditis are so frequent that they are constantly being seen.

If now it is assumed that all of these diseases or perhaps symptoms of a disease are the result of an infection, it neces-

sarily follows that there must be some portal of entry for the invading organisms or so-called primary focus. Conceding that their portal of entry may vary in different cases, we are, nevertheless, confronted by the striking fact that there is no part of the body in which streptococci flourish as they do in the mouth and throat. Admitting this and this group of cases particularly, acute endocarditis becomes primarily a surgical condition and secondarily a medical condition. In other words, if one is convinced that an acute tonsillar infection is providing the source of the streptococci that are producing the endocarditis, get rid of the primary focus.

So much has been written on the question of focal infections in reference to the mouth and throat, and so much poor as well as good work has been done in this direction that what always happens in medicine is beginning now to happen in surgery. So many teeth have been removed and so many tonsils enucleated without results that the pendulum is beginning to swing back, and everywhere we hear of the abuse of the teeth and the tonsils by the medical men. This movement will unquestionably be productive of good results because it will be productive of thought, and will unquestionably place focal infections in their proper place as a cause of disease. In the meantime, however, we must not lose track of the fact that diseased teeth and diseased tonsils will always be a source of certain cases of sepsis, and as such will always call for surgical treatment. Given a septic case, every well-trained man immediately looks for a definite primary focus, and whether this be in a diseased appendix or a sinus-thrombosis, quoting two common sources, very little time is wasted in administering drugs. Surgery is called for and surgery is used.

In acute endocarditis we have typical sepsis. Blood cultures may be negative and frequently are negative, especially in those cases of endocarditis occurring in children, but the bacteria have invaded the heart valves notwithstanding, and if possible the medical man must treat his case by removing the primary focus, thus preventing the harmful effects of additional bacteria invading the already damaged valve. If an infected tooth is the primary focus, get rid of the infected tooth; if an acutely inflamed or, as is very much more frequently the case, a subacutely infected pair of tonsils is responsible for the secondary lesion in the heart, get rid of the tonsils, and enucleate them, not when the damage to

the heart valve has been so great that complete return to normal is impossible, but as soon as the heart valve has become involved, in the hope that the body will take care of and destroy those bacteria that are doing the damage, provided that no more are added from the original source. This treatment sounds probably too radical if one accepts the oft-repeated theory that it is not advisable to open fresh blood vessels, as is necessary in tonsillectomy, in the face of an acute infection. The inconsistency of medicine was never more apparent in any theory than in this one. It is not so many years since the same argument was advanced in connection with the treatment of an alveolar abscess around a necrotic tooth. We still find dentists who hesitate about extracting a tooth if an abscess is present. In the face of well recognized surgical procedures, what argument can be raised to justify such unsurgical treatment? The surgeon does not hesitate to expose the blood vessels of the abdominal wall to infecting bacteria if there is suppurative appendicitis or cholecystitis. The matter is never given a second thought in face of the greater danger involved in leaving the infected viscera where secondary peritonitis will be productive of far greater harm. It is the same situation where endocarditis has developed. Granting that tonsillectomy is not an operation of choice during an acute or subacute inflammation, in view of the far greater danger of the endocardial involvement, it becomes an operation of necessity.

As stated previously, the object of this paper is to deal essentially with those cases of acute endocarditis occurring in children in whom there has previously been no cardiac disease. It might be more definitely construed that the type of acute endocardial inflammation to which special attention is called is that in which the endocarditis develops in the course of an acute, or rather subacute, inflammation of the tonsils. The following cases exemplify the type of disease under consideration.

CASE I. M. G., age six years. First seen March 6, 1915.

*Family History*—One sister had acute endocarditis after scarlet fever. Otherwise negative.

*Previous History*—Development normal. Had pertussis at the age of eight months. Bronchitis at the age of four. No other infections. No sore throat or tonsillitis.

*Present complaint* began about five days ago, with malaise, rise of temperature, without other symptoms. This lasted twenty-



four hours, then the child was allowed to get up and was perfectly well for three or four days. Then temperature rose, and a diffuse hyperemia of the skin occurred. This lasted twenty minutes. Patient was seen at this time, and aside from a slight rise in temperature the examination was negative. She was seen twenty-four hours later, and the examination was still negative. Was kept in bed for twenty-four hours, then allowed to get up and was apparently perfectly well at this time. She was not seen again until March 19, 1915, about three weeks after onset of original illness, and the following history was obtained. She had gone to school several days in the interim, but had not been real well. On three or four days she ran a little temperature. Occasionally vomited. Appetite was variable. On March 16, 1915, three days before being seen, she became much more prostrated and developed a temperature of  $104^{\circ}$ , which temperature had persisted ever since. On March 18, 1915, the glands on both sides of the neck became enlarged. Her temperature rose and malaise became much more pronounced.

Physical examination revealed a well-developed, well-nourished child of six years. Her general appearance suggested the presence of some severe acute infection. Cheeks were flushed, she was more or less prostrated, and was not at all interested in her surroundings. Tongue protruded in the median line, slightly coated. Teeth were negative. Throat; the tonsils on both sides were red and subacutely inflamed without any exudate, follicular or membranous. Ears were negative. Glands; cervical glands, posteriorly and anteriorly, particularly in front, were enlarged to the size of a lima bean. Slightly tender, but not red. Thorax was well developed. Heart; the area of cardiac dullness was not increased. At the apex, where two weeks before the sounds had been perfectly clear, the first sound was now the seat of a soft, blowing murmur. This was also heard in the pulmonary region. Aside from that, the sounds at the base were negative. Lungs were normal. Abdomen; liver and spleen not palpable. No masses or points of tenderness felt. Reflexes and extremities negative. Leukocytes 30,000, with an excess of polymorphonuclears. Urine negative. Blood culture not made. Widal negative. Case was seen in consultation with Dr. Houston, who concurred in the diagnosis of tonsillitis followed by lymphadenitis. Also seen in consultation by Dr. Wilbur, who concurred in the diagnosis of acute endocarditis occurring as a result of an

infection into the tonsils, and from the tonsils into the glands. Patient was removed to the Children's Hospital, and the tonsils were enucleated, about four days after the original diagnosis was made. The temperature that had been septic gradually receded. The leukocytes that had been around 30,000 dropped gradually to 20,000, until the third day, when coincidental to the development of an alveolar abscess they rose to 36,000, being accompanied by a corresponding rise in temperature. This was opened, however, and they promptly dropped, reaching gradually a normal mark at the end of two weeks. Coincidental with this all of the symptoms of acute infection gradually disappeared. The child was taken home, kept at absolute rest, given plenty of good nourishing food, and the murmur gradually began to diminish. She was kept quiet for about six months, at the end of which time she was gradually gotten up, and the amount of exercise slowly increased. At the present time, thirteen months after original illness, patient is up and around, the murmur is scarcely audible, and everything in connection with the case points to a complete restoration of her heart to a normal condition.

CASE 2. A. B., age three and one-half years. Was taken acutely ill in 1912 with the development of an acute inflammation of the tonsils and nasopharynx, accompanied by rise of temperature and a moderate amount of prostration. At the end of four days the glands on both sides of the neck, originally only slightly enlarged, increased very perceptibly, and with this increase the temperature rose to  $102^{\circ}$ . It continued to be high, from  $100^{\circ}$  in the morning to  $102^{\circ}$  in the afternoon. After a period of two weeks, at the apex, where previously the heart sounds had been perfectly clear, a faint systolic murmur developed. In view of the continued temperature, of the enlarged glands, and the subacutely inflamed tonsils, a tonsillectomy was done at the end of four days, the idea being if possible to prevent any further damage to the heart valve. Following the tonsillectomy the patient made an uninterrupted recovery. Temperature dropped to normal in one week. Glands gradually receded, and the murmur at the apex did not increase. Child was kept in bed four months, at the end of which time he was gradually gotten up and around. Ever since then he has enjoyed excellent health. The murmur gradually receded in intensity until at present it can no longer be heard, three and one-half years after the original trouble.

CASE 3. J. G. S., age nine months.

*Family History*—Negative.

*Previous History*—Nursed for six weeks, then given a certified milk formula, which agreed with him very well. Development normal. In May, 1915, at the age of seven months, patient developed a cough after an infectious cold. The cough persisted. Also occasional hoarseness. Was examined thoroughly. Examination included an X-ray of the chest. Nothing was found. No infectious disease. Cough and hoarseness gradually subsided.

*Present complaint* began about one month ago, October 25, 1915, with restlessness at night and development of ammoniacal urine. This persisted and with it there gradually developed a slight temperature. With this rise of temperature was more or less malaise and pallor. On November 18, 1915, on examination where previously heart sounds had been perfectly normal, there was a distinct systolic murmur at the apex. Leukocyte count was 24,000. He was seen at this time by Dr. Houston, who made a diagnosis of subacute inflammation of the tonsils involving the glands of the neck. He was also seen by Dr. M. R. Gibbons, who concurred in the diagnosis of an unquestionable acute endocarditis as a result of a tonsillar infection. The tonsils were removed on November 25, 1915. The patient made an uneventful recovery from the operation. The leukocyte count dropped to normal, and the temperature receded. It was not possible to keep him as quiet as one would desire on account of his age, but he was spared as much as possible. At the present time, four months after onset of original trouble, the mitral systolic murmur is still present, but very much less intense than when first examined. The general condition of the child has improved enormously. As to the future of the heart condition, one can only think that the very definite improvement in four months suggests the probability of a continued change for the better.

CASE 4. Courtesy of Dr. R. Bine. Age three years.

*Family History*—Except for measles, patient has always been well.

*Present complaint* began about one week ago, February 11, 1915, with what was described as acute indigestion. Then developed sore throat. Child complained of severe pain on left

side of neck. Examination revealed large and bulging tonsils, especially on one side. No exudate. Glands on one side of neck were enlarged to the size of a lemon, very tender, but no fluctuation. On examination of the heart there was a loud, short, blowing, systolic murmur transmitted to the axilla. No dullness in the lungs. Abdomen was moderately full, no tenderness, liver and spleen not palpable. It was thought from the history that the endocarditis had developed during the present illness.

*Course of Illness*—The child's temperature continued to range between  $99.5^{\circ}$  and  $103^{\circ}$ , being apparently of the usual septic type. On February 27, 1915, temperature shot up to  $103.2^{\circ}$ , the neck became much more swollen and tender, and in the center of the mass on the neck fluctuation was apparent. The tonsils were still markedly swollen and the heart condition unchanged. In view of the fact that the tonsils seemed responsible for the abscess in the neck and probably for the heart condition, and the fear that some other complication might result, removal of the tonsils was thought to be urgent, and the child was taken to the hospital that afternoon, February 27, 1915, and the tonsils were enucleated. Leukocytes 15,900; 76 per cent. polynuclears.

The tonsil contained a small abscess cavity with distinct yellowish pus. The mass on the neck was incised, but no pus found. Since the operation the highest temperature has been  $99.8^{\circ}$ , in marked contrast to what it was before the operation.

*March 23, 1916*—Child is in excellent condition. Practically no enlargement of the neck is noticed, but there is a small lump palpable, evidently the remains of the gland enlargement. The heart is O. K. except for a persistent systolic mitral murmur.

For a moment let us presume that these cases had not been tonsillectomized. What treatment might have been offered them? Essentially nothing. Salicylate of Soda in large doses has long been used in the treatment of endocarditis. The results have been, to say the least, questionable. In those cases of mild endocarditis the condition would have subsided notwithstanding the use of salicylate. In the subacute infections or malignant cases, salicylate has never been of any value. One will probably hear the argument offered that there is no way of deciding that the tonsillectomy was responsible for the process not progressing, and that therefore the operation was not justifiable. Arguing along such lines, one can only say that it is not logical to remove



the appendix in the acute catarrhal inflammations, because many of these cases subside, and peritonitis only occurs in a few of them, or do not do paracentesis in otitis media, because mastoiditis is exceedingly rare compared to the number of cases of otitis media that are seen.

The logic of the treatment is apparent enough if one accepts certain facts. First, that acute endocarditis is always a secondary infection. Second, that a very large number of these cases have for their etiological agent a primary focus in diseased tonsils. Granting these facts, which none will attempt to refute in the face of the testimony that can be offered, a choice must be made between two courses. On the one hand, to leave the primary focus alone, trusting that the forces of nature will be great enough to destroy the bacteria emanating from it, at the same time taking the chance that the ultimate damage will be so great as to place it forever beyond the possibility of repair, and, on the other hand, removing the primary focus in a child who is suffering from an acute infection, taking the chance that his lowered vitality makes him a poorer subject for surgical treatment, knowing that this added slight risk is more than compensated for by the fact that the patient is so placed in a position where his chances of combating the infection are increased manifold by eradicating the source of his disease.

PTHALEIN TEST IN ORTHOSTATIC ALBUMINURIA—Renal function, as measured by the phenosulphonephthalein test, in children with marked degrees of orthostatic albuminuria, is normal when the patients are at rest in bed. When these patients are placed in a position of accentuated lordosis, producing a marked albuminuria, the total output of phthalein in two hours is reduced—in T. C. Hempelmann's (*American Journal Diseases of Children*, 1915, Vol. X., p. 422) 7 cases, on an average 12.9 per cent. The most marked feature, however, is the retardation which takes place in the output during the first hour—the average of his cases being 17.6 per cent. less in the lordotic position. Normal children do not show this retardation and decreased elimination with the change of posture.—*American Journal of Obstetrics*.

# THE ELUCIDATION OF SOME ARRHYTHMIAS OF THE HEART IN CHILDREN BY MEANS OF THE ELECTROCARDIOGRAPH \* †

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Before proceeding to the discussion of arrhythmias of the heart, let us recall the physiology of the so-called normal heart.

The most distinctive function of heart muscle is rhythmic contraction. The frequency, or rate, of contraction of different parts of the muscle, if uninfluenced by outside forces, may vary. That portion lying at the junction of the right auricular appendix and superior vena cava, or sinus region, has the highest contraction rate; the rate of contraction of auricular muscle is less frequent, and the inherent rate of the ventricular muscle is least. The contraction of muscle tissue is accompanied by electrical changes, and heart muscle propagates this electrical change with an accompanying contraction. The rate of conduction of the impulse is slowest in the tissue of the ventricle (about 400 m.m. per second); faster in auricle (1,000 m.m. per second); and travels in the Purkinje fibers at the highest rate, probably five times as fast as in the other ventricular muscle. It has been shown that the left auricle contracts (0.013 of a second) later than the right, and the ventricles (0.2 of a second, or as seen in the records, P. to R time) later than the auricles. Each contractions of the heart muscles employs the full power of the muscle cells, and is followed by a period of rest, or diastole. For a brief interval at the onset of contraction, or systole, of the muscle it is unresponsive to another stimulus and is said to be refractory. When, during a series of rhythmic contractions, the muscle responds to an interpolated stimulus disturbing the rhythm by occurring too early, it is said to be premature or an extra systole (Figs. 3 and 4). Following this premature contraction is a long interval called the complementary pause, and preceding the contraction a short pause. The sinus portion of the heart contracts at a higher rate than the auricle, and even though the auricle contracts at a higher rate than the ventricle, the rate of

\* Read at the New York Academy of Medicine, Section on Pediatrics, December 15, 1916.

† From the Medical Department of the New York Post-Graduate Medical School and Hospital.

sinus usually controls. The contraction wave spreads in an orderly and progressive way over right auricle, left auricle, and then by the auriculo-ventricular bundle into the ventricle, it is therefore necessary to know that this control and sequence of contraction is maintained before we can state that any heart is acting properly.

The contraction frequency of heart muscle, if uninfluenced by outside conditions, is maintained as accurately as a chronometer. In the body the heart rate is normally under the guidance of the vagus and the sympathetic system, but under pathological conditions the whole heart or one set of chambers may escape from such control. Therefore, to know that a heart is functioning in a normal manner it is essential to learn about the time and sequence of contraction of the chambers; the site of the origin of the impulse and the path by which it travels, and the manner of the rate control (Figs. 1 and 2).

The irregularities of the ventricular rhythm, even with the clinical history and physical examination, does not indicate the origin of the disturbance. It is essential for intelligent treatment to know the cause of the irregularity of the pulse felt at the wrist or the irregularity of the ventricle as heard at the precordium. In the records the occurrence of the R wave corresponds to a ventricular contraction or pulse beat. The heart contracting at the rate of 72 per minute has an interval of 0.60 second between R waves. Between the perpendicular lines in the records there is an interval of time of 0.2 second. Keeping in mind that the R indicates an apex beat, it is easy to interpret the records in terms of palpation and auscultation.

Upon the findings, by comparison of electrocardiographic records, can be based some measure of prognosis, and the effects of treatment and results of functional tests of the conductive system can be recorded in an exact manner. Until very recently all that could be learned of the heart action was learned from the left ventricle and peripheral pulse by auscultation and palpation. The introduction into clinical medicine of the use of the polygraph supplied a means of obtaining some knowledge of the action of the right auricle and ventricles, and this knowledge of their action has stimulated a desire not only for more knowledge, but for an easier and more accurate method.

The electrocardiograph is the only instrument which, regardless of the physical form of the patient, can tell the position or

alterations in cardiac position; the preponderance in mass of one chamber over the other, the location of lesions; the source of the impulses producing contractions; that the control is normal or abnormal, the time and sequence of chamber contraction; the explanation of some physical signs; the functional efficiency of the auriculo-ventricular conduction; differentiate between heart rates of varying origin; and record precisely the effect of drugs on the cardiac mechanism.

This discussion is restricted to the presentation of a few records illustrating irregularities of the heart in children under fifteen years of age.

The records have been obtained from an examination of 92 children, selected from a large number because the irregularities were observed to differ from the common respiratory type, in which there is an increase of frequency of contraction with inspiration and a decrease of frequency with expiration.

Figs. 1 and 2 show changes in rhythm of the whole heart, not associated with respiration, and not occurring rhythmically. These irregularities disappear and the pulse becomes regular on exertion.

In Fig. 3 is shown a marked arrhythmia of the whole heart, due to changes in sinus rate and interposed premature auricular contractions. The difference in the form of the P wave shows the wave originates from an abnormal focus. Such foci are due to increased irritability of the muscle tissue.

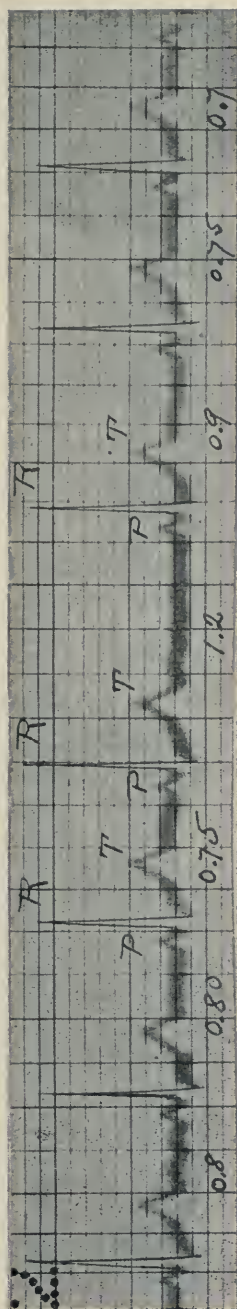
In Fig. 4 is shown a premature auricular beat, occurring during the refractory period of the conductive system, hence there is the intermission of a ventricular response.

In Fig. 5 is shown a pause of ventricle due to block of the impulse from the auricle, and a contraction of ventricle followed by a premature contraction with complementary pause and heart block, again prolonging the pause. This peculiar irregularity was repeated at short intervals.

In Fig. 6 is shown the onset of block and ventricular tachycardia due to digitalis, and in Fig. 7 is seen the form of the curve four days after the discontinuance of the drug. It is particularly interesting to notice that the T wave is upward in Lead II, where it is often downward from the effect of digitalis as long as ten days or two weeks after the last dose.

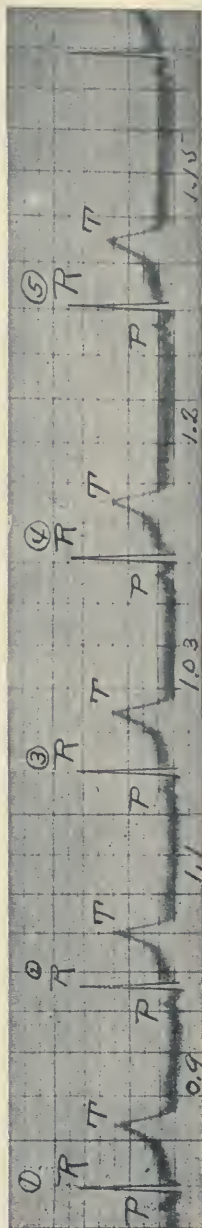
In Fig. 8 the auricles are contracting at a rate of one beat every 0.6 second with a P to R time of 0.2 second, and the form





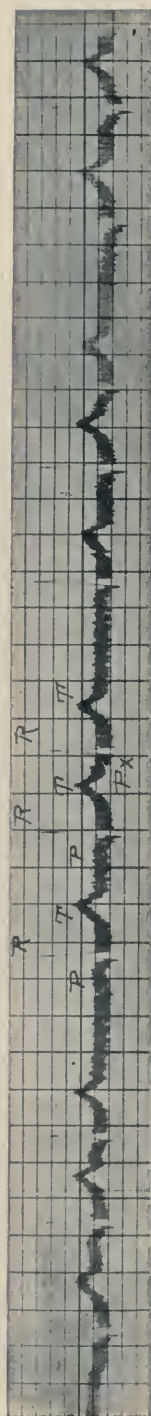
#### LEAD II.

FIG. 1.—C. O., Female, 14. Marked change in contraction rate of whole heart, not dependent on respiration. Time of the auricular or ventricular interval, P to P or R to R time, 0.8 sec., long period 1.2 sec.

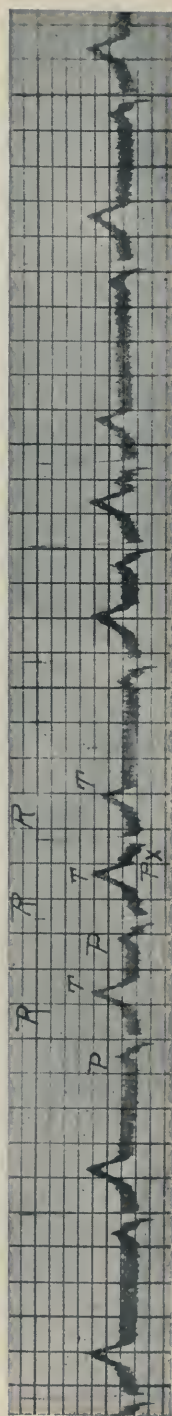


#### LEAD II.

FIG. 2.—V. Mc., Male, 12. Variations in interval, P to P or R to R time between contractions of whole heart not coincident with breathing. Time shown by figures at bottom of record—0.9 sec. to 1.2 sec.



LEAD I.

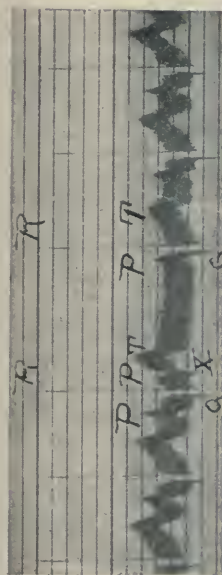


LEAD II.



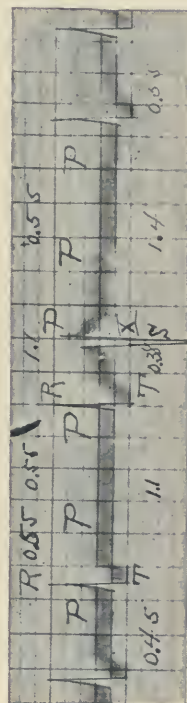
LEAD III.

FIG. 3.—J. A., Male, 10. No diseases but measles. Contraction rate 60 per minute increases in next beat to 100 per minute and then a premature auricular contraction in 0.4 sec. is followed by a pause of 1 sec. to 1.1 sec.



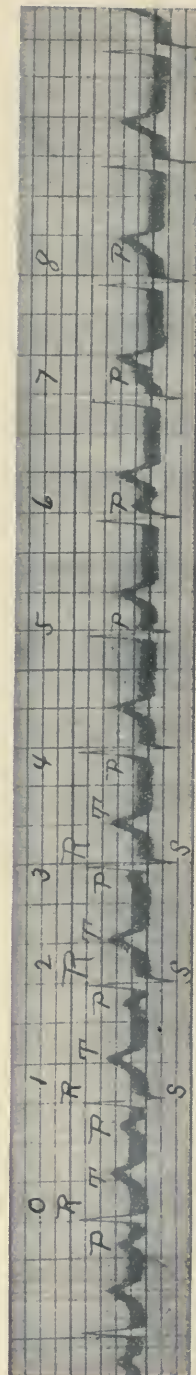
LEAD II.

FIG. 4.—F. R., Female, 7 months. Auricular premature (X) contraction coincident with ventricular contraction. Negative or downward direction of P form indicates origin from abnormal point. Long complementary pause of auricular and ventricular rest increases conductivity rate and P is close to R of next cycle.



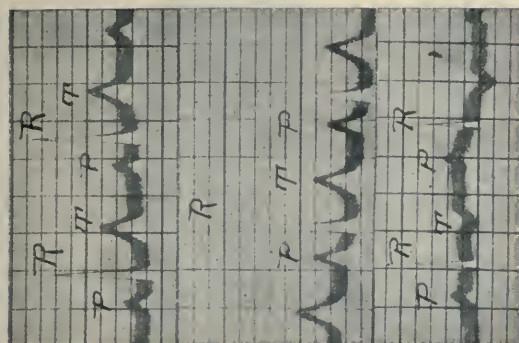
LEAD III.

FIG. 5.—A. B., Female, 14. Shows A-V block followed by P to R time (conduction time) normal 0.2 sec, then an auricular (P) contraction is coincident with the premature ventricular (X) contraction, and again A-V block, followed by partial block, as shown by prolonged conduction time of 0.3 sec. Interval between the auricular (P) contractions is 0.55 sec.



LEAD I.

FIG. 6.—F. W., Male, 14. Regular rhythm with onset of block from digitalis. Ventricular complex R S assuming new form—compare complex (0) with (1) because impulse originates at new focus though continuing same rate of contraction.



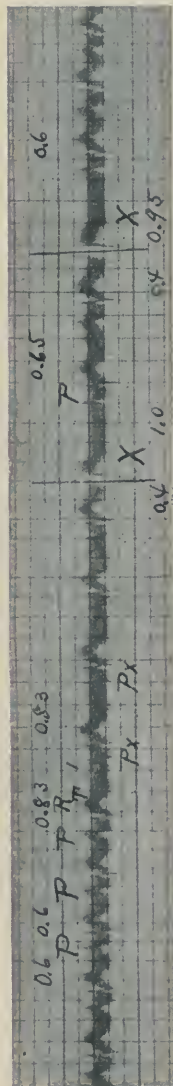
LEAD I.

LEAD II.

LEAD III.

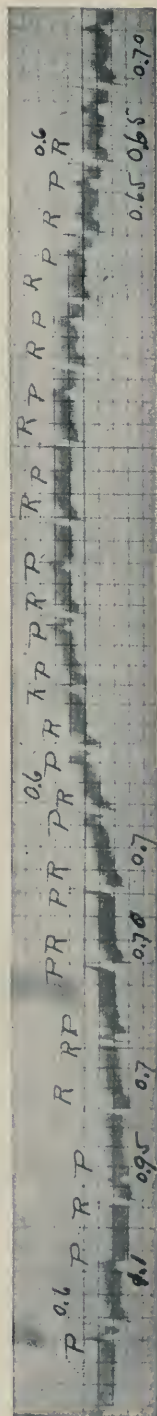
FIG. 7.—Same boy four days after digitalis discontinued. Notice increase amplitude of R and T in Lead I, and no downward deviation of T in Lead II.





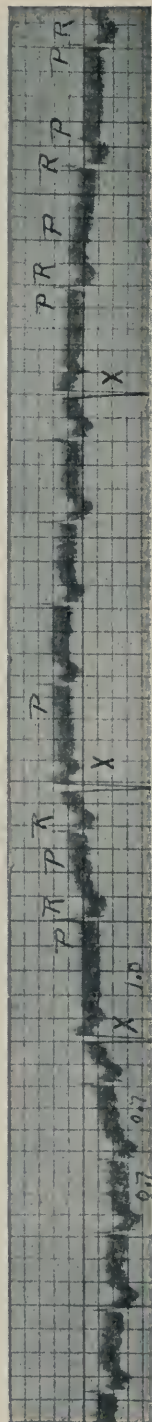
LEAD I.

FIG. 8.—E. D., Female, 15. Rheumatic endocarditis and decompensation. Digitals effect. Occurrence of auricular (Px) impulses from abnormal point for short period terminated by premature ventricular (X) contractions. The ectopic origin of Px is shown by the variation in form of P. The high auricular rate with time interval of 0.6 sec. gives way to the slower with 0.83 sec. which is terminated by a premature ventricular (X) contraction, and complementary pause of 1.0 sec. A short period of normal is again interrupted by a repetition of abnormal rhythm, and terminated in same manner.



LEAD II.

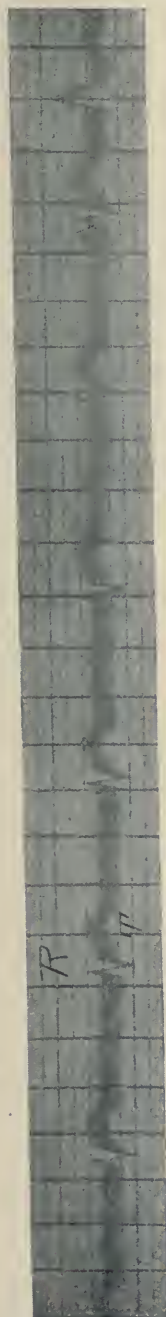
FIG. 9.—Same case, record obtained a few moments later than No. 7. Shows period of complete dissociation of auricles from ventricles. Auricular interval (P to R) remains at 0.6 sec. while ventricular interval (R to R) is 0.7 sec., then association recurs.



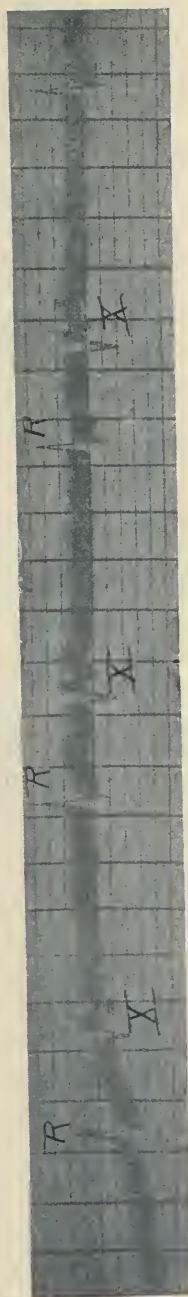
LEAD III.

FIG. 10.—Same case as No. 7. Occurrence of premature ventricular (X) contractions and complementary pause followed by dissociation of auricle and ventricle.

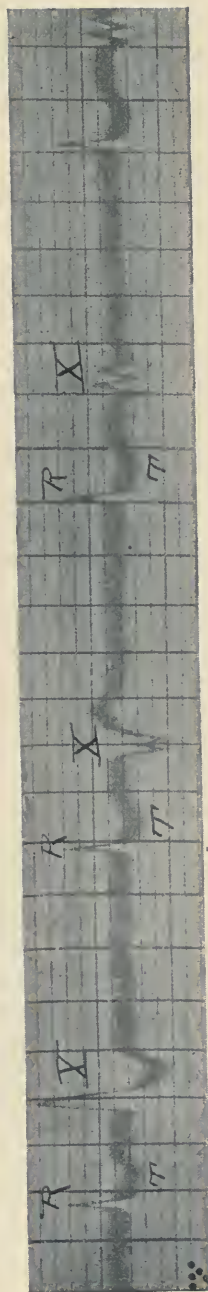




LEAD I.



LEAD II.



LEAD III.

FIG. 11.—Same case as Fig. 7, record taken next day. Auricle fibrillating (shown by absence of P waves) and complete heart block (shown by regular recurrence of R) with occurrence of premature ventricular (X) contractions 0.4 sec. after the normal ventricular response. Variation in form of these premature (X) beats due to change of focus of origin.

of the P changes coincident with a contraction interval of 0.83 second. This slower rhythm is terminated by a premature contraction of the ventricle, and followed by a return of the previous rate control.

In Fig. 9 is shown the continuation of the rate of 100 contractions per minute, but complete dissociation is gradually replaced and rhythm is re-established. During the period of block the ventricle beats at a slower rate than the auricle, but at the high rate of 85 per minute. The high ventricular rate of contraction is common in dissociation from digitalis.

Fig. 10. Premature ventricular contractions appear at intervals, and on the next day (Fig. 11) each supraventricular beat is followed by a contraction due to impulses arising in the ventricular portion of the conductive system. This is the coupled beat of digitalis poisoning.

No example of auricular flutter was found. Examples of fibrillating auricle returning to normal rhythm were found in 3 cases, and heart block and premature systoles induced by digitalis in 2 cases.

The records have demonstrated variations in time of impulse formation; the refractory period; the complementary pause following premature ventricular contractions; premature auricular contractions; premature ventricular contractions of varying origin; complete dissociation of auricle and ventricle; retarded conduction or first stage of heart block; auricular fibrillation and ventricular tachycardia, following and depending upon the administration of digitalis.

Without the electrocardiograph this demonstration would have been impossible.

Of the irregularities, those due to the auricular and sinus variations in time are benign; while disturbances of ventricular rate and rhythm, or dissociation of ventricle from auricle and fibrillation of the auricle are usually of serious import. Nor does it seem to be wise therapy to permit our drugs to produce these lesions.

In closing let me remind you that the occurrence of serious irregularities of the heart in children is rare, but children with irregularities are so frequently put to bed and a serious prognosis given the parents that this presentation may serve to procure the careful examination and elucidation of such cases.

*152 West Fifty-Eighth Street.*

# THE TRANSMISSION OF BOVINE TUBERCULOSIS TO HUMAN BEINGS

BY MAZYCK P. RAVENEL, M.D.

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The amount of work done along these lines during the past year, though small in amount, has been notable. Eastwood and Griffith in Great Britain have made a study of the relative distribution of the various strains of tubercle bacilli in bone and joint tuberculosis and also in a few cases of tuberculosis of the genitourinary tract. The material in the bone and joint cases was removed directly from an affected area or from an abscess in the neighborhood of the lesion.

Of a total of 261 cases 55, or 21 per cent., showed the bovine tubercle bacilli. Ten were atypical. All of the patients showing bovine infection except 3 were under sixteen years of age; 155 cases were under ten years of age, and of these 45, or 29 per cent., showed the bovine bacilli; 106 cases were over ten years of age, and out of these 10, or 9 per cent., showed bovine infection. This work again emphasizes what has been known for some years, namely, that the danger of bovine infection is greatest in the early years of life.

It seems to me a mistake to emphasize this too strongly as regards bovine infection, since all of our studies for many years past have been driving us to the conclusion that childhood is the time of infection for all types of tubercle bacilli, whether human or bovine. Therefore the ability of the bovine tubercle bacilli to infect infants and children does not seem to be an exception to the general rule. We have been forced to the conclusion that infection of adults with the human tubercle bacillus is much less common than was formerly believed, and it is possible that further studies which will take into consideration the relative proportion of human and bovine infection will show that adults are infected with the bovine tubercle bacillus relatively as frequently as with the human.

The work of A. Philip Mitchell, begun in 1911, was referred to in my last report. This has been continued.

The glands of 29 children below 12 years of age obtained postmortem were examined. Only 12 cultures were obtained, 8 of which were of the human type of bacilli and 4 of the bovine. It is interesting to note that in those which showed the bovine

bacilli the caseation of the mesenteric glands were more extensive than in any other group.

Mitchell has examined the glands of 80 children obtained at operation. Forty-two of these were residents of Edinburgh and 38 came from the neighboring country. In 71, or 88 per cent., the bacillus causing the lesion was of the bovine type, while in only 9, or 12 per cent., was the organism of the human type. Most of the children were under two years of age, and 84 per cent. had been fed unsterilized cow's milk since birth. In this connection Mitchell's studies of the milk supply of Edinburgh are extremely interesting. Of 406 samples of mixed milk examined 82, or 20 per cent., showed tubercle bacilli. He rightly, but very conservatively, concluded from his work that bovine tuberculosis cannot be considered a negligible factor in the spread of tuberculosis among children.

The past year de Besche has reported another instance of infection with both the human and bovine types of bacilli. In the investigation of this subject this possibility of double infection which has been shown by the English Commission, the German Commission and a number of private workers should always be borne in mind.

I cannot conclude without once more raising my voice against the cocksure way in which some investigators speak of the portal of entry of the tubercle bacilli based almost entirely upon what they consider the oldest lesion, and judge of this further by the type of the tuberculosis. Thus F. A. Bartlett, in his analyses of 178 autopsies on tuberculous children, concluded that in children primary infection of the lung is the usual mode of infection, since 82 per cent. of his cases were of the pulmonary type. He somewhat naively says that the absence of tuberculous lesions from the lungs in 14 cases and the presence of such lesions in the bronchial lymph nodes in 7 of these seem to show that it was possible for the tubercle bacilli to pass through the lungs without localizing. He concludes also that the largest number of cases were of inhalation origin, as shown by the fact that the pulmonary lesions were the most advanced in the body.

In animals it has been conclusively shown that pulmonary tuberculosis can be easily produced both by feeding and by injection of tubercle bacilli directly into the stomach, producing this type of disease and the oldest lesions in this part of the body by an infection of known intestinal origin. It seems almost certain that the same thing may take place in children.



# SCARLET FEVER AND MEASLES OCCURRING SIMULTANEOUSLY IN THE SAME INDIVIDUAL, THE OTHER CHILDREN OF THE FAMILY ACQUIRING MEASLES ONLY\*

BY D. J. MILTON MILLER, M.D.

Atlantic City, N. J.

The case is reported because it was thought it would be of interest in connection with the papers on measles to be presented at this meeting, and not because it exhibits a condition of very great clinical rarity. The patient convalescent from an infectious disease is undoubtedly more susceptible to other infections of this class than a healthy individual. To observe one or more of these diseases follow each other in quick succession is not an infrequent experience. Formerly it was thought that a patient suffering from one infectious disease was, during its course, naturally immune to another. This was Hebra's teaching. We know now that this conception was erroneous, and that the coexistence of two or more of these diseases is not rare.

Scarlet fever and diphtheria, for instance, are very frequently associated, and the same may be said of measles and whooping-cough. An instance of this combination I saw recently, and I have encountered chicken-pox during the course of typhoid fever on several occasions. Sometimes three or more infectious diseases coexist: for instance, C. B. Kerr has observed measles, scarlet fever and pertussis; scarlet fever, chicken-pox and whooping-cough; scarlet fever, mumps and pertussis; scarlet fever, diphtheria, chicken-pox and whooping-cough. The pertussis patient, indeed, as is well known, is peculiarly susceptible to other infections. In the majority of double infections, one of the associated diseases either follows or precedes the other; rarely is the outbreak of the two simultaneous. When it is, especially in the combination of scarlet fever and measles, the diagnosis is not always easy. Even Heubner, with all his experience and powers of differentiation, remarks that the diagnosis in the presence of this combination must always be difficult. Notwithstanding this, scattered through the literature may be found many examples of the concurrence of the two diseases.

\* Read at the Twenty-eighth Annual Meeting, American Pediatric Society, Washington, D. C., May 8-10, 1916.

As has been stated, the exanthemata may precede or follow each other, or they may coexist from the first. In C. B. Kerr's case, the scarlet fever preceded the measles by two days. J. Forsyth Meigs observed one case in which the scarlatinal eruption appeared as usual, on the second day; on the second day of the rash, laryngeal cough and lachrymation; and on the third day of these symptoms the measles eruption showed itself. In another case of Meigs', the measles appeared as the scarlatinal efflorescence was abating. In a case noted by v. Pirquet and Shick, the rashes of the two exanthemata seemed to have appeared almost simultaneously, as they were both present on admission. The two eruptions were so confused and blended that the diagnosis would have been impossible, had it not been for the cough, coryza and Koplik's spots, combined with the scarlatinal angina, fall of temperature by lysis and typical scarlatinal desquamation. Rolly reports a case in a child of one and a half years in which the measles rash followed the scarlet fever eruption by three days. Both the diseases were well marked, and did not materially modify one another.

Huckciwicz observed 21 cases of combined scarlet fever and measles. He says that the greatest difficulty arises when measles precedes scarlet fever. When the latter is the primary disease, the eruption is apt to be characteristic, and the diagnosis not difficult. This writer also states that scarlet fever following measles appears on the chest, legs and arms in large, smooth, bright-red patches, of the size of a man's palm, and involving those parts of the skin where the measles eruption is not well marked. In a few hours this condition disappears, leaving the typical scarlet-fever rash, which, in turn, fades, disclosing the vanishing brown stains, so characteristic of measles. The latter part of this description coincides with the course of events in my case; but it is not probable that the combined eruptions follow any well-defined course in all cases.

The two diseases do not appear to be, in their clinical courses, much modified by occurring concurrently; but there is a general impression among writers that where scarlet fever follows measles the mortality is higher than when the reverse is the case. Thus, in Heubner's clinic, of 10 cases of measles in connection with scarlet fever, 1 died; while of 10 cases in which scarlet fever followed measles the mortality was 4.

One should exercise care in diagnosing a double infection

from the rash alone, since in measles the rash may, in certain portions of the skin, closely resemble the efflorescence of scarlet fever; while the eruption of scarlet fever is frequently distinctly morbiliform—sufficiently so, at times, to confound the very elect.

#### CASES

Charles L., *aet.* eight years, began to be ill with catarrhal symptoms and fever on June 12, 1915. The temperature soon fell to normal, but rose again on the fourth day (June 15th) to  $104^{\circ}$ . The patient was first seen on this date, and exhibited the usual symptoms of measles. Typical discrete maculo-papules were visible on the face, behind the ears and on the chest. There were cough, coryza and lachrymation. The tongue was coated, but the papillæ were not enlarged. The pharynx was congested, and an eruption could be seen on the soft palate and uvula; upon the buccal mucous membrane Koplik's spots were still visible. On the flexure surface of the right elbow was a diffuse erythematous patch, the size of the child's hand. It formed a continuous uniform blush, and was not punctated; it was regarded as of the nature of a prodromal rash. The next day (June 16th) the temperature was  $105^{\circ}$  (the second day of the eruption of measles, and the fifth day of illness), and the child was quite uncomfortable. Upon the face, hands, thighs, legs and lower abdomen there was a continuous erythematous blush, not punctate in character. The maculo-papular eruption upon the face had given place to a uniform blush, with well-marked circumoral pallor, but within the blanched area the papular eruption of the day previous could still be discerned. On the chest, back and upper abdomen the eruption maintained its morbiliform character; cough was troublesome, and the photophobia and coryza continued. The papillæ of the tongue were not enlarged. On the following day (June 17th) the temperature was  $102^{\circ}$ . The scarlatiniform rash was receding from the face, but persisted as a continuous sheet on the forearms, hands, buttocks, thighs and legs. On the skin, discrete papules were visible, and on the trunk the crescentic-like eruption of rubella. Between the papules, however, the skin was the seat of an erythematous flush not usually seen in measles. The gums and mouth were sore, but the pharyngitis was abating. On June 18th and 19th the temperature was  $101^{\circ}$  and  $99^{\circ}$  respectively,

and the catarrhal symptoms were subsiding. The scarlatinous erythema, as well as the papular eruption, was also abating. On June 21st the temperature was  $98.5^{\circ}$ . This was the sixteenth day of the disease, the seventh day of the measles eruption, and the sixth of the scarlatiniform. Desquamation had begun upon the forehead and cheeks. On June 22d otitis media occurred, with a rise of temperature to  $101^{\circ}$ . On June 23d (the ninth day of the scarlatiniform erythema) desquamation, pin-point in character, began upon the forearms, lower abdomen and upper thighs. The appearance of the white line at the junction of the skin of the finger-tips and the nails (subungual cleavage, so-called) gave evidence of beginning desquamation of the fingers and toes. Peeling of these members followed promptly, and was most characteristic, leaving no doubt as to the scarlatiniform nature of the eruption. The desquamation was not completed until the lapse of seven weeks, and involved the whole body, except the trunk, where the eruption had been morbiliform in character, and where the desquamation was furfuraceous only. The tongue of the patient never assumed a distinct so-called strawberry appearance, notwithstanding the profuse character of the skin desquamation. Whether this was due to the modifying influence of the rubeolous infection it is impossible to say. When, however, in double infections the scarlet fever is the precedent disease, the usual tongue of scarlet fever is seen. The mouth and gums were sore, as in measles, while the temperature fell by lysis, as is customary in typical scarlet fever.

On June 27th, sixteen days after Charles's initial symptoms, and twelve days after the eruption, his sister Frances, *aet.* five, had fever ( $101.2^{\circ}$ ), the next day Koplik's phenomena, and on the fourth day the petechial eruption of measles. Thereafter followed a typical attack of measles, *not followed by desquamation*. The child was not isolated from her brother, and did not contract scarlet fever.

On July 10th, another sister, Edith, *aet.* eighteen months, exhibited the initial symptoms of measles and Koplik's spots. The attack ran a normal course. It began thirteen days after her sister's first symptoms, and eleven days after the rash. This child never came in contact with the brother, who apparently had had measles and scarlet fever concurrently.

On July 15th, a fourth child, Edward, three years old, had headache, fever and Koplik's phenomena. Three days later the



characteristic rash of measles appeared. This attack began five days after the beginning of the preceding case, and eighteen days after the initial symptoms and fifteen days after the rash of the second child.

To sum up, in a family of 4 children 1 child apparently had measles and scarlet fever almost simultaneously, and the other 3 had measles alone. The history of the attacks in the last 3 cases, the presence of Koplik's phenomena, and the interval between the attacks, leave no doubt that all the children suffered from measles. That the first case was one of double infection is also quite probable. The coryza, cough and Koplik's spots established its rubeolous nature, while the scarlatiniform erythema of large portions of the skin and the characteristic prolonged desquamation, especially the subungual cleavage, leave equally little doubt that the patient also had scarlet fever. Except for the initial febrile albuminuria, the urine in not one of the children was at any time abnormal.

*127 South Illinois Avenue.*

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**NUTRITIVE VALUE OF BOILED MILK**—The experimental work involved in a report by A. L. Daniels, S. Stuescy and E. Francis (*American Journal Diseases of Children*, 1916, Vol. XI., p. 45) is the result of an attempt to determine the comparative nutritive efficiency of milk heated to different temperatures. Their results point to the conclusion that milk heated to the boiling temperature or thereabouts is an inadequate food. Rats fed on boiled milk grew to about half their normal size. Although they were able to keep these experimental animals for many months on boiled milk, in no case was there reproduction, nor did any of the animals reach the normal weight for adult rats. Milk which is kept at the boiling temperature for forty-five minutes is no less efficient as a food than milk boiled for much shorter periods—ten minutes or one minute. The chemical changes which make heated milk an inadequate food are brought about at the boiling temperature or thereabouts. The value of pasteurized milk as a food, therefore, will depend on the temperature to which it is heated during the pasteurization process. Heating milk to a higher temperature than boiling (114 C.) makes it even less valuable as a food.—*American Journal of Obstetrics.*

## HISTORY OF PEDIATRICS IN NEW YORK—II.

BY ABRAHAM JACOBI, M.D.

New York

My friend and successor in Columbia University, Dr. Holt, has collected for me the names of the children's hospitals in fifty American cities of more than 100,000 inhabitants. These I required for a paper I contributed in 1913 for a "festschrift" dedicated to Professor Adolph Baginsky. It carried the title "Pediatry in the United States," and forms the sixtieth and sixty-first volumes of the *Archives für Kinderheilkunde*. Many of those institutions (which are counted) are indeed not hospitals, but rather nurseries, or receptacles. Such, for instance, are St. Mary's, Laura Franklin, St. John's Guild, Nursery and Child's, Foundling, Randall's Island and others. St. Christopher's, in Brooklyn, is of the same nature.

As long as New York City has no infant or child institutions like those of Petrograd, Paris, London and others, we are pleased to know that we have in New York wards of large institutions which compare favorably with those foreign institutions. A child's ward was established in Bellevue thirty years ago, which for years contained thirty or forty beds, over which I myself had the opportunity to preside. Dr. La Fètra controls a much modified, improved and increased number of wards containing one hundred and more modern infant's and child's beds. The St. John's Guild has taken charge of babies and children these fifty years. Its City Hospital was closed fifteen years ago, and its sixty beds ceased their work, to enable the Guild to spend its means on its Floating Hospital. Numerous infants and children, with their mothers, enjoy and profit by several dozen seaside summer excursions. They must always bless the memory of its seaside hospital at the shore of New Dorp, Staten Island. The Guild has been active since 1866; however, for the summer only. From year to year its size and arrangements have been increased and improved, until lately the service has been increased and become extended over the twelve months of the year. Two excursions were conducted by the Guild in hired boats in 1873, eighteen in 1874. The Floating Hospital was greatly improved by the gift, in 1899, of Mrs. Augustus D. Juilliard, who presented in 1916 another fine boat for the same purpose.

New York is always rich and always helpful; but its need is growing with its vastness and its increase in its poor population. Large hospitals have wards for the young. They were at first small, but have added to their size and activities. St. Luke's Hospital had, sixty years ago, a small orthopedic ward, which has become a child's ward. The Presbyterian Hospital was small, but has now a large ward under Dr. Northrup. The Mount Sinai Hospital arranged a permanent service more than thirty-five years ago. It has been controlled by Dr. Jacobi, by Dr. Barnum Schaulau, and for the past dozen years by Dr. Koplik. The one hundred beds which were expected to fill it are waiting for its completion. The small ward of Roosevelt Hospital, under Dr. Jacobi, and now under Dr. Freeman, and the new Jacobi Division of the German Hospital, have been mentioned. Brooklyn has quickly and actively followed the examples established by its larger sister. Several hospitals have built houses and founded wards.

Orthopedic dispensaries and hospitals have been one of the principal boons of New York City. The first was founded by Dr. Louis Bauer, a German, who established himself in Pacific Street, Brooklyn, in 1852, after his migration from Prussia. He had been a member of the Prussian Assembly, where he had been *persona non grata* with the government. Unfortunately his temperament made him uncomfortable as a neighbor; that is why his correct knowledge did not make his propinquity very pleasant. He emigrated to St. Louis. Dr. Davis was not in accord with him, though his accomplishments were quite well recognized. Dr. Davis's apparatuses were highly appreciated by the most honored men in the profession. Dr. Lewis A. Sayre was always a most efficient practitioner and consultant. His position in the Bellevue College and Hospital, and his large practice, made him very prominent; his son and successor is to this day a gracious and successful orthopedist and teacher. Dr. Charles Fayette Taylor practiced in the same line with great success, being one of the founders of the Orthopedic Dispensary, East Fifty-ninth Street. Some of his devices were much used, though some of his theories were far from seeming acceptable. His belief in the nervous origin of infantile paralysis was *not* acceptable. He took the stand that alleged American nervousness was a frequent cause of poliomyelitis. His son, Henry Ling Taylor, occupies a pleasant position both in the public and in the professional eye. Mean-

while Dr. James Knight had occupied quite a position as an orthopedist, and acquired a host of friends who, in 1863, aided him in the establishment of the Society of the Hospital for the Ruptured and Crippled. For years the hospital was located at 97 Second Avenue, the former dwelling of Dr. Knight, who spent all his love, order and economy on this enterprise. The new building in East Forty-second Street was erected in 1870. Long before the farsighted Dr. Knight established a dental clinic for the children, in 1865, with the aid of two generous dentists, Dr. Wm. Rausch and Dr. Kasson Gibson. His programme remained the same. He supported the modest and industrious poor with ruptures, scrofula, hip disease, paralysis and utero-abdominal ailments, without trying actual surgical, that is, operative relief. When he died, in 1887, Virgil T. Gibney, who had assisted him many years, became surgeon-in-chief. He attached to himself William T. Bull, Royal Whitman and others, who enriched the hospital activities by their surgical skill, mainly in hernia operations. With industry and knowledge he aided his cause in giving orthopedics a basis of exact science. He surrounded himself with a number of superior men, amongst whom I may mention Dr. Wisner Townsend, who will long be deplored on account of his practical and scientific accomplishments, and his professional and ethical conduct. This raised him to an enviable position as a physician and consultant, as Secretary of the Medical Society of the County and State of New York, and a Trustee in the American Medical Association. He was finally gladdened by the new Hospital for the Ruptured and Crippled, which, on East Forty-second Street and First Avenue, with its 250 beds, gave him and Dr. Gibney food for work and study.

One of the most prominent institutions in the city was the Orthopedic Hospital on East Fifty-ninth Street. It was founded by Dr. Charles Fayette Taylor, whom I mentioned. His successor as surgeon-in-chief was Newton M. Schaffer, 1876-1900, and, finally, Dr. Russell A. Hibbs since 1900. It was opened at 1299 Broadway, and moved to 126 East Fifty-ninth Street in May, 1873. Here the hospital department was opened with seventy beds. In 1901 the visiting nursing department was added (now 15 nurses) and in July 1904 the Country Branch and Industrial School at White Plains for joint tuberculosis (134 beds). In January, 1916, the dispensary and hospital moved to 420 East Fifty-ninth Street (100 beds).



Finally, during the last ten years, the Hospital for Deformities and Joint Diseases, under the leadership of Dr. Henry Frauenthal, has, not gradually but rapidly, grown into a large hospital and dispensary, built mainly for the young and very young, benefiting thousands of every description. Thus New York gives vast contributions of beneficence. For instance, the work of Dr. Jaeger in the German Hospital and other institutions is recognized as a prominent benefaction. Thus New York City has spent some decades in fruitful efforts in the evolution of pediatric endeavors.

The vast majority of infant deaths by the thousands occurred in the first year or two of life; respiratory diseases killed more in the second and third years.

According to Dr. Holt's statement, during the last year many respiratory diseases have been prominent. Thousands died during that time of pneumonia. A few weeks ago some learned men read papers and more discussed the subject. I cannot say that I was pleased, for Dr. Cole has not yet given us a serum which will cure a large percentage of our pneumonias. I have been over the ground for more than sixty years, and believe American pediatry has been and can be more successful than we were told on the Academy floor. American pediatry is more successful and therapy shows better results than the large audience were told. When I left I regretted that I had not communicated the greater success I had participated in for scores of years. *Your* 20 and 30 per cent. of pneumonia mortality is quite bad; my *four* is better. A few weeks ago I looked over the records of the Jacobi Division of the German Hospital. Dr. A. L. Goodman and his two assistants, Dr. Leopold and Dr. Moffett, have profited by what the experience of scores of years has taught me. They avail themselves of no new medication, but they use old medication with greater knowledge and advantage. They have used, like others, warm and cold water, digitalis, camphor, caffeine, spartein, strychnia sometimes; *but better than others*. I rarely treated an adult or a child pneumonia without digitalis. American practitioners have gradually ceased to be cowardly. If faint-heartedly you wait for changes or chances to turn up, you lose your patient. Pneumonias have no stomach for waiting. In treating pneumonia some American doctors have learned to know that hearts lose strength from day to day. I repeat that hearts lose strength by the hour, unless they are stimulated at once and persistently. Small doses are insufficient;

big ones are demanded, and they must be reliable drugs. Digitalis alone may not be sufficient. Spartein sulphate should accompany it in good doses. The modern American pharmacopeia is no guide for you or your patients. Ignorance of apothecaries has been presiding over it. I read in it that  $\frac{1}{4}$  grain of spartein sulphate is proclaimed to be *the* dose for an adult. But very rarely  $\frac{1}{8}$  or  $\frac{1}{4}$  is sufficient as a baby's dose, provided you want it to be efficient; and you want it repeated frequently. Caffein is one of the efficient drugs, that means 4 or 6 or more grains a day for a baby. Camphor has been neglected by us. A year old baby may require 2 or 4 or 8 or 10 grains a day. Urgent cases require the medication under the skin. Camphor in 4 parts of sweet almond oil, not in the solution of ether or alcohol, which are both painful—and pain exhausts. Sodio-caffein benzoate or salicylate in 2 parts of water, 4 or 10 or 15 grains a day or more. Small doses are thrown away; big doses save your babies and children. These are grateful, and you save them. And have no fear of combining several of them. Strychnia should not be used unless the pulse is very small and tension too low. Alcohol is useless in the very beginning, but pleasant after a few days, and in sepsis is urgently required in large doses, such as I have advised in septic diphtheria. All of these things do no harm; on the contrary, if you are not afraid of acting properly, no crisis need terrify you.

The Polyclinic and the Post-Graduate Hospitals, which were established in the same months thirty years ago, began the treatment of babies and children, and the successful teaching of their hygiene and diseases to large classes of practitioners. A member of their professional staffs has presented to you, a short month ago, the vast material he is prepared to teach them in wards which have been increased in numbers and sizes and laboratories grown in practical importance. Let him add my teachings. I repeat, large doses, four or six times larger than what you read in your text books, save your children. Small doses may appear to suffice you, but they suit the undertakers only. Still the patients require large doses to escape them.

The Babies' Hospital, an offshoot of the first Babies' Ward in the Post-Graduate Hospital, was incorporated as a separate institution in June, 1887, with Drs. Julia and Sarah I. McNutt in charge. They resigned in 1889, when the institution was located at 161 East Thirty-sixth Street, with a capacity of eight beds.

Then Dr. L. Emmett Holt was appointed attending physician. In 1910 the entire cost of the latest building was \$250,000. According to the last annual report, patients treated were 1,628, deaths were 423, autopsies 375; that means 88.6 per cent. of the deaths. Here again he furnishes an example, as in many other things. At the present time there is on the staff a visiting pathologist, a resident pathologist and three workers on the house-staff, a resident physician and two assistants. There were 4,805 new out-patients. A chemical laboratory for research has been supported by a grant from the Rockefeller Institute since 1910. All of them have enriched American pediatry under Dr. Holt's supervision and leadership.

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BACILLUS DYSENTERIÆ AS A CAUSE OF INFECTIOUS DIARRHEA IN INFANTS—C. Ten Broeck and F. G. Norbury (Boston Medical and Surgical Journal, 1916, Vol. CLXXIV., p. 785) say that negative bacteriological and agglutination tests for the dysentery bacillus in cases of infectious diarrhea of infancy are of comparatively little value, and in making the agglutination test a number of cultures must be used for the agglutinogens. In spite of these facts the dysentery bacillus was isolated from 74.6 per cent. of the cases studied. Only 14 of the 19 bacteriologically negative cases were studied for agglutinins, and 64.3 per cent. of these, or 12 per cent. of the total number, gave a positive reaction, thus making a total of 86.6 per cent. of the 75 cases in which there was good evidence that the dysentery bacillus was present. They have been unable to obtain any evidence that *Bac. welchii* is ever the cause of infectious diarrhea and all of their results point to the dysentery bacillus as the etiological agent. In their cases all these bacilli belonged to the mannit-fermenting group. In spite of the apparent scarcity of dysentery bacilli in the feces, they believe that they are the cause of infectious diarrhea of infancy for the following reasons: (1) Their universal association with the condition; (2) the great numbers of these organisms in the mucosa of the cecum; (3) the sick individual produces immune bodies against them while such bodies, specific for the other assumed etiological agents, have not been demonstrated; (4) experimentally they are known to produce a diarrhea.—*American Journal of Obstetrics*.

## SOCIETY REPORT

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### THE PHILADELPHIA PEDIATRIC SOCIETY

*Stated Meeting, Held June 13, 1916*

PRESIDENT JOHN F. SINCLAIR, M.D., IN THE CHAIR

DR. PHILIP ATLEE SHEAFF, in demonstrating an electrically-lighted speculum for use in the diagnosis and treatment of vulvovaginitis in children, said: "In the Children's Vaginitis Clinic of Dr. John F. Sinclair at the Presbyterian Hospital, we have been using the urethroscope as the best available means at our command for visual examination of the vagina.

"The restricted view obtainable by this instrument has been far from satisfactory, and as the vagina, even in a small child, is quite capacious beyond the hymen, other means than those in hand became desirable.

"The instrument which it is my pleasure to present before you this evening is the outcome of research and criticism recently carried out along these lines, and its use has successfully supplanted the urethroscope in this clinic.

"By its aid we are able to demonstrate, at one view, a very much larger area of mucous membrane than formerly observed; the entire external os is readily seen and sufficient room for topical application or the obtaining of discharges from selected areas is maintained.

"It consists of a bi-valvular speculum, tubular in shape, containing an obturator to facilitate introduction; one blade carrying a light chamber upon its inner or concave surface; both blades maintained in relation to each other by a joint of special construction, together with a thumb-screw, which latter also controls the separation and approximation of the blades in such a way that a maximum separation of the distal portion is obtained, with very little separation at the vulva. The instrument may be taken apart by removal of the thumb-screw.

"The bi-valvular method of dilatation is an old and well-known principle and needs no description, by the construction of the joint in this instrument places the fulcrum in such position that its proximity to the hymen especially fits it for use in small children by meeting anatomical conditions peculiar to that age.



"In the instrument presented, the light chamber is within the tubular portion and is open at its extreme distal extremity beyond the window, this adding to the illumination when the instrument is drawn in the closed condition toward the operator.

"The lamp connection in the urethroscope is centered by means of a dowel pin. In the instrument demonstrated the lamp connection is maintained in position by a small clip, which prevents dropping out or withdrawal unless a quarter turn of the part be made."

DR. CHARLES V. DORWARTH presented a paper on "The Establishment of a Department of Preventive Medicine in a Hospital for Children." (To appear in a later ARCHIVES.)

DR. McC. HAMILL presented a paper on "The Health District in Relation to Infant Mortality." He said: "The population of our large cities is made up of groups of people representing many nationalities and varying greatly in intelligence. The problems of the different sections of our cities differ, therefore, in their nature and solution. If effective work in the prevention of disease is to be accomplished, the health conditions which these varying groups create must be known and properly interpreted. Health departments as at present constituted and equipped are not able to study the fields in which they work.

"The existing system is also unfavorable to a proper coöperation and coördination of the work of the several divisions of the health department and the other departments of the city government that have to do, either directly or indirectly, with the maintenance of the health of the city. It also makes the education of the masses extremely difficult.

"The question that naturally arises is, What is the solution of these difficulties? The Child Federation of Philadelphia has been conducting an experiment as a contribution to a satisfactory answer to this question. The experiment referred to is the Federation's Health Center, and in order that you may understand the application of this answer, I will define briefly the idea and work of the Center.

"The distinctive feature of the method that the Child Federation has pursued in trying to illustrate the value of district direction of the health of a city has been its intensive character. The procedure was as follows: Fifteen city blocks covering the most thickly populated portion of the Italian district were selected

for the experiment. This district was chosen for five reasons: (1) It had a high infant mortality; (2) it contained the most ignorant and most recently arrived of the Italian settlers; (3) it was thickly populated; (4) it included some of the most unsanitary streets of the city; and (5) it presented special problems on account of the superstition of the people and their lack of knowledge of the language of the country.

"To get the best understanding of the problem and determine the most effective method of procedure, it was decided to limit the field work in the beginning to one city block, the most thickly populated and unsanitary in the district. The first act of the workers was the taking of a census of the block, classifying its inhabitants. As we were primarily interested in the infants, the mothers were asked to take their infants to the Center building for medical examination and guidance, and all expectant mothers were referred for the same purpose. As the confidence of the family was obtained, the unsanitary conditions of the home were pointed out, their possible effect upon the health of the family made clear, and the methods of correcting them explained. In practically every household where infants were found it was necessary to correct the mother's lax methods in the care and feeding of her baby.

"While this field work was going on, the Center building became an extremely active institution. The Center and its purpose became so well known to the community that we were constantly appealed to for assistance in all sorts of emergencies.

"Whilst we felt that our work was eminently successful, we realized that we only touched the surface. We have very broad plans for the future which we hope to carry out in conjunction with the Health Department which has joined with us in establishing the first health district in the city of Philadelphia.

"One of the most important and helpful procedures during the control of the Child Federation was the close coöperation with the city departments.

"The best measure of the success of work of this character is probably the death rate among infants. The statistics covering divisions as small as those we were working in have been so unsatisfactorily recorded in Philadelphia that it has been impossible for us to make an effective comparison of the mortality before and after the Health Center work began. We do know, however, that we have had an extraordinarily low death rate.

"But we did not measure our results by this method alone. From the fact that we taught the mothers in all of the blocks in which we conducted our intensive work, their lessons well enough to stimulate them to bring their infants to us constantly that we might help keep them well; and the fact that we taught dozens of families to feel the necessity of better living quarters than they could secure in the districts in which they had lived; and the fact that the care given the children by their mothers and the conditions of cleanliness of the homes and alleys improved so tremendously—we know that the work was effective. But the total results of work of this character can never be expressed fully in any report; indeed, they are appreciated only by those who have known the people and their homes both before and after the work has been done.

"It would seem to matter little if the establishment of a district health department necessitated an increase in the appropriation for health work, if it can be shown that the health district is a more efficient method of preventing and controlling disease."

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PARAPNEUMONIC EMPYEMA—L. Gerdine's (American Journal Diseases of Children, 1916, Vol. XI., p. 33) 15 cases of typical lobar or bronchopneumonia in children under four years of age were studied by exploratory puncture and bacteriological examination of the fluid obtained. He says that fluid is present in the pleural cavity in a large number of cases of pneumonia before the crisis and can be demonstrated, sometimes by physical signs, sometimes by Roentgen ray, and by puncture, even when other physical signs are not apparent. The clinical course of the pneumonia may not be altered by this complication. In the majority of cases the fluid is serofibrinous in character, though perhaps containing a large cellular element, polymorphonuclear in type. These fluids are sterile as a rule. True pus is present much more rarely and may contain organisms of more or less virulence. The frequency of the presence of organisms in these cases cannot be decided on the data as yet secured. The virulence of the isolated organisms determined by animal inoculation seems to be of value in prognosis. Only in cases with serofibrinous and purulent fluids containing organisms of a high grade of virulence should surgical interference enter into consideration.—*American Journal of Obstetrics.*

## DEPARTMENT OF ABSTRACTS

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### ORIGINAL CONDENSATIONS OF CURRENT PEDIATRIC LITERATURE BY THE EDITORS AND THE FOLLOWING ASSOCIATES

Charles E. Farr.....	New York City	Raymond B. Mixsell....	Pasadena, Cal.
Morris Friedson.....	New York City	Rudolph D. Moffett....	New York City
Gaylord W. Graves.....	New York City	Willard S. Parker.....	Boston, Mass.
Howard K. Hill.....	Philadelphia, Pa.	Mark S. Reuben.....	New York City
Jerome S. Leopold.....	New York City	Mills Sturtevant.....	New York City
William Lyon.....	Jackson, Mich.	Samuel W. Thurber....	New York City
John B. Manning.....	Seattle, Washington	Eugene F. Warner.....	St. Paul, Minn.
Stafford McLean.....	New York City	Edwin T. Wyman.....	Boston, Mass.
Carlo D. Martinetti.....	Orange, N. J.	J. Herbert Young.....	Newton, Mass.

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FETTEROLF, GEORGE: A CASE OF VAGOTONIA, APPARENTLY ORIGINATING IN THE NASAL ACCESSORY SINUSES. (*Annals of Otology, Rhinology and Laryngology*, September, 1916, p. 587.)

Vagotonia is defined as a condition of excitement of a group of nerves called the "extended vagus." This group includes the vagus and those which functionate similarly and in antagonism to the sympathetics. The nerve fibers of the autonomic system which arise from the brain are contained in the third, seventh, ninth, tenth and eleventh cranial nerves. Those which have to do in this case are found in the seventh, ninth, tenth and eleventh and innervate the blood vessels of the mucous membrane of the mouth, throat, nose and its sinuses, salivary glands, heart muscle, trachea, bronchi, esophagus and down the digestive tract. In action the two groups of autonomic and sympathetic nerves are antagonistic and upon the proper balance between the two depends the normal functioning of the structures to which they go. The action of these opposing groups has been brought out by the use of drugs, epinephrin being the stimulator of the sympathetic system, and atropin, thus far, is the drug which seems to affect the autonomic system, but more as a sedative than stimulator; pilocarpin, however, is a strong stimulator for certain organs such as the salivary glands.

The symptoms of vagotonia are such as would be expected when the autonomic system is stimulated.

The case reported was that of a boy of twelve, who for five years had been failing in health. His active history began with measles, which left him with a profuse nasal discharge which never became thick or yellow. There was profuse sweating at



night and his sleep was disturbed by sneezing and coughing. His adenoids were removed, but this was followed by increased discharge and a double otitis media. He was tested with pilocarpin for vagotonia and the result was positive. Some slight improvement was obtained by the use of belladonna and creosote carbonate. Two years later he returned very ill, having lost 9 pounds in four weeks. He was now vomiting a large amount of mucus and had a marked salivation. An X-ray of the nasal sinuses showed suppuration of the left posterior ethmoid cells and sphenoid sinus. An operation was done in which these were opened and free drainage obtained. This was followed by very rapid and marked improvement and later autogenous vaccines caused the almost complete disappearance of the nasal discharge.

The author considers this the first case to be placed on record in which a chronic sinusitis was the cause of such widespread vagotonic phenomena.

S. W. T.

NETTER, ARNOLD: THE ACCIDENTS OCCURRING AFTER SERUM REINJECTIONS AND PREVENTATIVE INJECTIONS OF ANTIDIPHTHERITIC SERUM. (*Archiv. de Med. des Enf.*, October, 1916, Vol. XIX., No. 10.)

In reply to a letter sent by the Academy of Medicine on February 29, 1916, the author, the permanent Secretary of the Medical Society of the Hospital of Paris, submitted his reply with the following conclusions:

The author believes that serious accidents following subcutaneous serum injections are in reality very rare, whether primary or reinjections. The fear of accidents should not hold back the use of serum where its use is indicated, especially as a preventative when diphtheria has appeared in a family or in a crowded institution.

The Commission replied to the Director of the Academy as follows:

(1) Serious accident following the first injection (serum disease) or after reinjections of serum (anaphylactic accidents), are very rare, especially when made subcutaneously into the cellular tissues. Fear of accidents should never deter us from recourse to serum therapy.

(2) The Academy of Medicine, in regard to the preventative use of diphtheria-antitoxin, holds still to the opinion put

forth in May, 1902. These injections should be made when diphtheria has appeared in families, in orphan asylums, in the wards of hospitals and in children's schools. At the same time with the injection, the Academy believes that disinfection, the isolation of the patient, examination and the treatment of possible carriers should still be continued wherever possible. H. K. H.

THEISEN, CLEMENT F.: AN EPIDEMIC OF A SEVERE FORM OF ACUTE INFECTION OF THE THROAT, WITH ABSCESS FORMATION. REPORT OF 58 OPERATIONS. (*Annals of Otology, Rhinology and Laryngology*, September, 1916, p. 661.)

In the winter of 1915-1916, in Albany, 384 cases of this affection came under the author's personal observation. Of these, 58 required surgical measures; 44 were peritonsillar abscesses, and in nearly all these cases diseased tonsils were present, the majority being of the buried type. In 6, abscesses developed on both sides. There were 2 cases of infection of the epiglottis and 2 abscesses of the lingual tonsil and a like number of retro-pharyngeal abscesses.

The writer believes, with Semon, that the various forms of acute septic inflammation of the throat and neck are degrees of the same process. The infection comes from one of the varieties of streptococcus. In the cases occurring in children between six and fourteen, acute otitis media developed in about half the number. There were no mastoid complications in all those who had prompt incisions of the drum membrane. Nearly all the abscesses were opened under local anesthesia and the author is of the opinion that general anesthesia in these cases is not safe. His conclusions are: (1) The epidemic subsided when pasteurized milk was used. (2) Virulent streptococci show preference for certain structures. (3) Organisms from milk resemble rheumatic strains culturally. (4) Involvement of muscles and joints occurred in patients infected by milk. S. W. T.

BINNIE, J. F.: CONGENITAL PYLORIC STENOSIS. (*Colorado Medicine*, November, 1916, p. 330.)

The medical treatment of this condition receives but scant consideration and is passed over with the general remark that the happy results which are reported following such treatment

occur because the hypertrophy does not infringe too seriously on the lumen, the mucosa may not be engorged or thickened, plugs of mucus may be absent and muscular spasm may be lacking. The author believes that when one compares the mortality after medical and surgical treatment one is compelled to conclude that provided an efficient surgeon and proper surroundings are obtainable every evident case of congenital pyloric stenosis ought to be subjected to operation.

A valuable feature of the paper is the two mortality tables given below:

TABLE A

## GASTROENTEROSTOMIES ALMOST EXCLUSIVELY

	No. of Cases	No. of Deaths	Percentage
Downes .....	22	7	31.8
Scudder .....	17	3	17.6
Richter .....	22	4	18.1
Roland Hill .....	10	5	50.
Stillman .....	10	2	20.
Holt .....	28	14	50.
Binnie .....	2	0	0.
	<hr/>	<hr/>	<hr/>
	111	33	31.5

TABLE B

## MODERN PYLOROPLASTIES AND PYLOROTOMIES

Ramstedt .....	2	0	0.
Lilianthal .....	1	0	0.
C. S. Mixter .....	8	1	12.5
A. A. Strauss .....	20	1	5.
	<hr/>	<hr/>	<hr/>
Total—Tables A and B..	142	37	26.

Different operative procedures are briefly described.

J. B. M.

PRIESTLEY, JOHN: HEART DISEASES AMONG ELEMENTARY SCHOOL CHILDREN. (*The British Journal of Children's Diseases*, December, 1916, p. 23.)

Where school children are taken without selection in a routine manner, giving particular attention to the heart, deviations from the normal, trivial or otherwise, may be detected in about 40 per cent. During four years inspecting 20,000 children annually, the percentage of cases noted by all inspectors together as having some heart affection were 6.5, 5.97, 7.17 and 7.15. These may be taken to represent the proportion of cases of heart affection, which no one would deny to be worthy of note, out of the 40 per cent. of cases, trivial or otherwise, which are known to exist.

In over four years, out of 70,138 Staffordshire boys and girls, in equal proportions between the ages of five to six, eight to nine, twelve to thirteen, thirteen to fourteen, 674 had signs of organic valvular disease, 48 being considered congenital and 626 acquired. This represents .96 per cent.

Analyzing the group of 626—	Cases	Percentage
Mitral regurgitation .....	562	83.1
Mitral stenosis .....	27	4.0
Mitral regurgitation and stenosis..	49	7.3
Tricuspid .....	5	0.7
Pulmonary .....	26	3.9
Aortic .....	7	1.0
	<hr/> 676	<hr/> 100.0

A surprising number of these with organic heart murmurs had no discomfort whatever, the announcement being received with surprise and incredulity. Among 622 old cases with organic valvular heart disease which the author has had under observation for several years, more than 55 per cent. have never at any time suffered from their ailment. In this non-complaining group every variety of murmur is represented.

Of the 278 complaining children in this group, mention was made as follows: Malaise alone, 145; cyanosis, 57; dyspnea, 50; pain over heart, 30; headache, 30; fainting attacks, 17; edema, 8; palpitation, 4; sickness, 3; sleeplessness, 2; clubbed finger, 2;



cough, 2; heart failure and loss of compensation, 2; epistaxis, 1; cough on exertion, 1; giddiness, 1. Some complained of more than one symptom. Among the functional murmurs and bruits heard over the precordial area, they are particularly common over the pulmonary area, where they are commonly regarded as anemic, but a surprising number of well-colored children have them in a typical form.

J. B. M.

BRYAN, J. H.: ON THE RELATION OF DISEASES OF THE ACCESSORY SINUSES TO DISEASES OF THE EYE, ESPECIALLY IN CHILDREN, WITH A REPORT OF 2 CASES. (*Annals of Otology Rhinology and Laryngology*, September, 1916, p. 618.)

That the accessory sinuses of the nose are often well developed in children and may occasion complications usually thought to be found only in adults has been well established.

CASE 1. On examining a child eighteen months of age who had a marked exophthalmos on the left side and who had been seriously affected with a recent attack of grippe, it was found that the seat of infection was in the ethmoid cells. At the operation a very large quantity of pus was evacuated from the whole ethmoid labyrinth on that side and when this was done the eye soon assumed its normal position and the child made a good recovery.

CASE 2. Chronic abscess of the posterior ethmoid cells and sphenoidal sinus causing marked exophthalmos in a boy of eleven years. There was a six weeks' history and X-ray plates showed the seat of infection. It was necessary to remove the whole inner wall of the orbit along with the diseased bone of the labyrinth involved. The eye soon assumed its normal position and vision was good.

S. W. T.

HIGGINS, T. T.: OVARIAN SARCOMA IN CHILDREN. (*British Journal of Children's Diseases*, June, 1915.)

Three cases of ovarian sarcoma in children are reported. In the first case, a girl of five years, there was a swelling in the lower abdomen accompanied by colicky pain and constipation. For the past week she had fever, had vomited and passed a small quantity of blood per vaginam. On operation there was a mixed cell sarcoma of the left ovary. The child recovered. The sec-

and case was also one of a mixed cell sarcoma in a girl of ten years, who had complained of a lump in the abdomen, colicky pains, some constipation and loss of weight for five weeks. A good recovery was made. In the third case the tumor was in a child of seven years, with a duration of four months, who was admitted in an exhausted condition. Her temperature ranged from  $103^{\circ}$  to  $104^{\circ}$ . Edema of the lower extremities occurred, followed by exitus one month later. In this case the tumor weighed  $5\frac{1}{2}$  pounds. The section showed a round cell sarcoma.

The etiology of ovarian sarcoma is unknown. They are more common in childhood than in adults. A. Doran recorded a case in a fetus of seven months. Of 100 cases of ovariectomy reported by Bland Sutton in 1896, 21 cases were sarcoma. In this series 7 died at operation, 4 died at the end of one year. The disease appears to be insidious in its onset with colicky pains. Later the appearance of a mobile lump accompanied by pain and fever and with a tendency to spread by direct extension, not by metastasis, marks the condition.

C. E. F.

DICK, J. LAWRENCE: THE TEETH IN RICKETS. (*British Journal of Children's Diseases*, November, 1916, p. 332.)

These observations form part of a general examination of 1,000 school children in the East End of London, among whom distinct evidence of rickets was observed in about 80 per cent. For purposes of statistics, only records of the permanent dentition were used, as the infants' teeth were so universally decayed as to make accurate observation impossible. In 586 rickety cases, in which a record of permanent teeth could be taken, 42 per cent. had normal and 58 per cent. had defective teeth; 20 per cent. of these had hypoplasia frequently combined with decay, and 38 per cent. were decayed. Of the carious teeth the lower first molar was decayed in 80 per cent., the upper first molar in 30 per cent., one or more lower premolars in 30 per cent., and one or more upper premolars in  $12\frac{1}{2}$  per cent. The incisors, canines and second molars were seldom decayed. The shape of the incisors and canines protect them from the causes of decay to which the flattened secondary molars are subjected. The excessive decay of the first molars is attributed to the operation of the rachitic condition when the enamel of these teeth is being laid down.

J. B. M.

# ARCHIVES OF PEDIATRICS

MARCH, 1917

ROYAL STORRS HAYNES, PH.B., M.D. }  
HAROLD RUCKMAN MIXSELL, A.B., M.D. } Editors

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PUBLISHED MONTHLY BY E. B. TREAT & CO., 241-243 WEST 23D STREET, NEW YORK

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## ORIGINAL COMMUNICATIONS

### CLINICAL REPORT OF NINE CASES OF AMAUROTIC FAMILY IDIOCY

BY JUNIUS HARDIN MCHENRY, M.D.

Associate Neurological Surgeon, Polyclinic Medical School and Hospital  
New York

Warren Tay<sup>1</sup> in 1881 first published an article describing the changes occurring in each eye in the region of the yellow spot (mucula lutea) and says: "In an infant one year old in the region of the yellow spot of each eye there was a conspicuous, tolerably diffuse, large white spot more or less circular in outline and showing at its center a brownish-red, fairly circular spot, contrasting strangely with the white spot."

Without any knowledge of this ophthalmoscopic report, B. Sachs (1887) published the history and postmortem record of

a patient who had suffered with a peculiar form of idiocy with blindness. So thoroughly have these two men described the signs and symptoms of this disease, *Amaurotic Family Idiocy*, that in the medical nomenclature of to-day the linking of their names as "Tay-Sachs Disease" is as much used as its more descriptive one, first suggested by Sachs in his original monograph. His more recent report says it is "a family disease of infancy characterized by an entire lack of mental development, a progressive weakness of all the muscles of the body and rapidly developing blindness with typical changes in the macula lutea. The disease is generally fatal, the patients dying, as a rule, in a condition of marasmus before the end of the second year of life." The symptom-complex is definitely understood; however, the pathogenesis is still in controversy. Sachs<sup>2</sup> (1887) original opinion of "arrested cerebral development or agenesis corticalis" has been modified in a later report<sup>3</sup> (1898); he still holds, however, to the congenital idea and says: "The tendency of the degeneration must be born with the child and must reside in the germ plasm and not acquired by it." Kingdon<sup>4</sup> thought it an acquired disease, purely degenerative in character and not inherited. Hirsch<sup>5</sup> believed it an acquired disease, caused by some toxic agent without congenital influence. Cohen and Dixon<sup>6</sup> tried to unite the inherited toxic and degenerative theories into the cause and probably that might be the best explanation after all. However, from my clinical observations I am decidedly of the opinion that the etiology is one of *congenital inheritance* and not acquired, nor, as Jacobi<sup>7</sup> once believed it to be, "inflammatory" in origin.

A similar condition found in young children, termed "Juvenile Family Amaurotic Idiocy," described by Vogt,<sup>8</sup> Batten,<sup>9</sup> and Spielmeyer,<sup>10</sup> leading to blindness, frequently to paralysis and death after several years, has not been observed by us in the clinic. Only the clinical phases of this disease will be discussed in this paper. (I refer the reader to the reference list appended for further study and information of this interesting condition.)

The following cases were seen at the Polyclinic Hospital dispensary, Department of Neurology:

CASE I. E. P., female, first seen September 23, 1915, age eighteen months. She is the second child; the first, also a girl, age four years, is healthy and apparently normal in every way.



E. P. was a full-term child, of normal birth; was breast-fed for three months, then placed on bottle feeding. Her development seemed normal, like her sister, until about eight months of age, when her mother noticed where she formerly smiled and took notice of things about her, she now began to pay less attention to her surroundings, and would lie quietly in her crib, and later had difficulty in holding up her head. It was about this time, nine months, that her first tooth appeared, and her mother attributed her changing condition, therefore, to "teething." No convulsions. She did not seek medical aid until the child was one year old. The child began to lose in weight and the mother was told the child was suffering from malnutrition.

*Examination*—Showed a fairly well-developed child of blond hair and blue eyes; is a mouth breather, without evidences of either adenoids or enlarged tonsils. She is unable to sit or hold up her head; lies languid and apathetic, paying no attention to surroundings. The abdomen is distended; heart, liver and spleen normal sizes. No spasticity in the extremities; knee-jerks normal. Nystagmus. Wassermann and cerebrospinal fluid both negative. Cerebrospinal fluid by lumbar puncture showed increased pressure to a moderate extent by measurement.

*Eye Examination*—Pupils moderate size, reacting sluggishly to both light and accommodation. With the aid of the ophthalmoscope the fundi revealed a simple atrophy, and in the region of the macula lutea a circumscribed grayish-white discoloration in the center of which, at the place of the fovea centralis, the pathognomonic sign so characteristic of this disease, a "cherry-red spot."

The parents of this child both are Hebrews, born in Southern Russia, and bore no relationship to one another prior to marriage. Parents reported death of child at eighteen months of age; no autopsy.

CASE II. H. R., female, first seen February 7, 1916, age ten months. She is the tenth child; normal birth. One brother died at two years of age, "who went blind" (probably Tay-Sachs Disease); one sister at three years with meningitis; one sister at three months with bronchitis; one brother at three years with pneumonia. All other members of family healthy and normal. This child was all right until six or eight weeks ago, and now is listless, starts or awakens at slightest noise

(hyperacusis), is constipated. Has not cut any teeth and is losing in weight. Never had any convulsions. Lies placidly in bed. Cries very seldom. Mother says: "Child does not see good," and fears it may go blind like little brother who died eight years before.

*Examination*—Poorly nourished; blond hair with hazel eyes; distended abdomen; slightly exaggerated reflexes; very sensitive and easily startled by sudden touch or sound. Gives slight response to surroundings and shows impairment in sight. Wassermann and cerebrospinal fluid give negative findings.

*Eye Examination*—Pupils equal and of moderate size; react to both light and accommodation. The fundi show beginning optic atrophy with the "cherry-red spot" in the region of the macula lutea.

The parents are both living and well. No relationship. Both Hebrews and born in Russia-Poland, emigrating to this country when quite young.

CASE III. D. K. (see picture), female, age ten months, first seen April 13, 1916. Second child. Normal birth, weight 8 pounds.

(First child of mother weighed 10 pounds; in labor twenty-four hours; was big and healthy baby until five months, when it nursed with some difficulty. This seemed to increase rather than to improve. Breast-fed for one year, then placed on bottle feeding, but lost in weight continuously, becoming more inactive and unresponsive, also gradually lost her eyesight. Had a convulsion and was taken to Bellevue Hospital and there slowly grew worse, dying at the age of fifteen months.) D. K., sister of the one just mentioned, and second child, was also of the blond type, and mother says almost exactly alike in appearance to the little sister who died. She nursed until twelve weeks old and then was bottle-fed. Always constipated and, like sister, began at the fifth month to lose weight, nursed poorly, became less observing, lying for hours sometimes without apparently changing position; soon could not sit up nor hold up her head and became apathetic, gradually losing eyesight. Did not cut teeth until twelfth month.

*Examination*—Well-nourished and well-formed child. Cannot hold up head, or sit up. Complete placidity of extremities. Unresponsive in every way. Lungs and heart negative. Wassermann reaction of child, also of both mother and father, were all

negative. Cerebrospinal fluid under moderate pressure by lumbar puncture.

*Eye Examination*—Pupils dilated and react sluggishly to light and accommodation. Fundi show optic atrophy and the familiar phenomenon and characteristic “cherry-red spot” in the region of the macula lutea.

The parents are Hebrews, mother a Roumanian and father a Russian Pole, and were no relation to each other.



CASE III. at 5 months, just prior to onset of disease symptoms



CASE III. at 23 months, 10 days before death. Note extreme marasmus and spasticity of extremities, with marked deformities of both arms.

*Reported*—This child continued to grow worse, had a convulsion, was taken to a nearby hospital, and died after one week at the age of fifteen months, the exact age of the death of her sister, who died of the same disease. No autopsy.

The mother of these children, an intelligent young woman, was educated in this country, coming here at the age of five. It is to be noted from her statement, her second cousin has been the father of two children, both diagnosed to be “amaurotic idiots,” both of whom were females, one dying at eighteen months and the other at twenty months of age. Neither he nor his wife were any relation, but both Hebrews, coming from Southern Russia.

That mother is again pregnant and is fearful of the results, but profoundly hopeful of raising a normal child.

CASE IV. E. D. (see picture), female, first seen July 25, 1916, age thirteen months. First child of parents; easy and normal labor; full term; breast-fed until eleven months old; and was in every way apparently a normal, healthy baby. Said "mamma" at nine months and would wave "good-by" with hand. At the tenth month mother noticed child began to lose



CASE IV. at 6 months, before onset of disease symptoms



CASE IV. at 13 months. Completely blind. Placid

interest in play things, and would feel around as if unable to see them. Did not notice objects before her eyes. Can no longer sit up as before; has become listless, languid and unobserving. Starts and jumps at slightest noise, and mother says, "Jumps like having a nightmare while asleep." Continued to grow more passive. At twelfth month had convulsions (June 13, 1916), lasting all that night, one after another. Called local physician, who diagnosed case as "Little's disease."

*Examination*—Fairly nourished child; has great difficulty in taking her bottle. Lies placidly in bed with feet in extended



position. No spasticity of extremities; knee-jerks exaggerated. No Babinski; abdominal reflexes present. Heart and lungs negative.

*Eye Examination*—Pupils equal, react sluggishly to light and accommodation. Fundi pale, showing simple atrophy and in the region of the macula lutea a grayish-white appearance, with the "cherry-red spot" at the fovea centralis. The Wassermann reaction was negative.

The parents are Hebrews, both born in Vienna, Austria. No consanguinity. In no previous generations can any such history be obtained.

CASE V. E. F. (see picture), female, first seen in August, 1916, age twenty-two months. First child, full term, normal birth, weighing 8 pounds. Was breast-fed for one year; healthy and strong;



CASE V. at 6 months, just prior to onset of disease symptoms

at four months could sit alone. When six months of age weighed 23 pounds; but mother noticed at this time lack of interest in play things, and difficulty in grasping them. Thought there must be some trouble with the child's eyes, and she consulted a doctor, who diagnosed the case properly and gave unfavorable prognosis. Child became constipated, and began to lose in weight. After one year great difficulty in taking nourishment. Noticed at this time stiffening of left leg and easily startled by noises (hyperacusis). This spasticity extended, involving all of the extremities until at present impossible to flex them. Marked wasting of muscular tissue continued until the child presents the pathetic sight, as seen in the picture, which speaks plainer than words can describe to you the real condition. Wassermann

and cerebrospinal fluid both negative. Cerebrospinal fluid by lumbar puncture showed increased pressure of moderate degree. The fundi, with aid of the ophthalmoscope, showed the characteristic "cherry-red spot."

Both parents Hebrews, born in Austria, their respective grandmothers being third cousins. Mother reported child died August 20, 1916, age twenty-three months. No autopsy.



CASE V. at 14 months. Completely blind. Placid

CASE VI. L. L., female, first seen September 10, 1916, age eighteen months. First child, normal labor, weighing  $8\frac{1}{2}$  pounds at birth, apparently healthy and strong; breast-fed until one month ago and is now bottle-fed. Cut first tooth at the fifth month, was playful, bright and cheerful until about nine months, and then began to have laughing spells, and started at the least noise. Has had two attacks of bronchitis. No other illness. Lost sight and became listless, unable to longer hold up head.

*Examination*—Fairly well-nourished, brown-eyed, brown-haired child, lays placidly with legs extended, no knee-jerks at present. Heart and lungs negative. Does not respond to light, apparently blind.

With aid of ophthalmoscope the "cherry-red spot" is found, but appears more of a brownish-red in color.

Mother and father Hebrews. Unrelated prior to marriage. Both were born in Russia.

Wassermann and cerebrospinal fluid both negative, though

fluid is under considerable pressure. No history of any convulsions.

CASE VII. S. S., female, first seen September 20, 1916, age seventeen months. He is the sixth child, three others living and well, two dead, one of summer diarrhea, the other of bronchitis followed by meningitis. She was full term, normal birth, weighing  $8\frac{1}{2}$  pounds. Breast-fed until fourteen months, then bottle-fed. Apparently normal child until six months of age, when it was noticed he was drowsy and had difficulty in holding up head; had an attack of bronchitis at this time. Cried a great deal and was easily startled by noises; lost interest in people and things. No convulsions; has had recurrence of bronchitis and is always constipated.

*Examination*—Distinct enlargement of the child's head, by measurement, circumference is  $19\frac{1}{2}$  inches; is unable to sit up or hold up head. Anemic and wasted. Slight internal squint of both eyes, which react slowly to light and accommodation. Nystagmus and hypotonia. Knee-jerks present and slight spasticity in lower extremities, more marked in right leg. Is blind in both eyes. With aid of ophthalmoscope the "cherry-red spot" in its field of grayish white is easily seen. Wassermann negative. Cerebrospinal fluid also negative, but under considerable pressure by lumbar puncture.

Parents are Hebrews, born in Russia and before marriage were unrelated.

CASE VIII. G. E., male, first seen November 20, 1916, age thirteen months. No miscarriages. One brother died at two years as result of scalding with hot coffee. One sister died at one year; mother says she was always sickly, could not sit up, began to lose flesh, and also her sight quite early, and body became stiff, and before death was blind. (In all probability amaurotic family idiocy.) Was strong, healthy child; up to eighth month would sit alone quite playful and attentive. When nine months old cut first tooth and began to topple over; could no longer sit up nor hold up head. Cried and startled easily; showed difficulty in nursing, so was placed on bottle feeding with no great improvement. No illnesses. No convulsions, has been more or less constipated.

*Examination*—Well-developed child, grey eyes, reacting very

slowly to light and accommodation. Knee-jerks exaggerated. Other organs normal. Some placidity of muscles of extremities; ophthalmoscope shows "cherry-red spot." Cerebrospinal fluid by lumbar puncture shows increased pressure. Wassermann negative.

Mother and father living and well. Russian Jews and unrelated prior to marriage.

Case No.	Age	Sex	Birth	Noticed First Symptoms	Reflexes	Hyperacusis	Inordinate Laughter	Constipation	Disturbance of Deglutition	Musculature	Noticed Vision Impaired	Nystagnus
I.	18 mo.	Female	Normal	Listlessness at 8 mo.	Normal	Yes	No	Yes	No	Flaccid	8 mo.	Yes
II.	10 mo.	"	"	Listlessness at 8 mo.	+	Yes	No	Yes	No	Slightly spastic	9 mo.	No
III.	10 mo.	"	"	Deglutition at 5 mo.	—	Yes	No	Yes	Yes	Flaccid	6 mo.	No
IV.	13 mo.	"	"	Listlessness at 10 mo.	+	Yes	No	Yes	Yes	Flaccid	10 mo.	No
V.	22 mo.	"	"	Listlessness and impaired vision at 8 mo.	—	Yes	Yes	Yes	Yes	Spastic	6 mo.	Yes
VI.	18 mo.	"	"	Hyperacusis at 9 mo.	+	Yes	Yes	Yes	Yes	Flaccid	10 mo.	No
VII.	17 mo.	Male	"	Listlessness at 6 mo.	+	Yes	No	Yes	Yes	Spastic	7 mo.	Yes
VIII.	13 mo.	"	"	Failure to hold head up 8 mo.	+	Yes	No	Yes	Yes	Flaccid	10 mo.	No
IX.	16 mo.	Female	"	Convulsion	+	Yes	No	Yes	Yes	Slightly spastic	7 mo.	No

CASE IX. B. M., female, age sixteen months, first seen December, 1916. First child full term, normal labor. When two months of age had a convulsion lasting intermittently twelve hours. No recurrence until four months later, when she had a similar attack lasting only the one day. There has been no return of convulsions.

When seven months of age child would no longer notice objects, nor play and smile as previously. Has always been constipated. Well-developed child, blue eyes and blond hair. Slightly spastic in all extremities. Pupils do not react to light



or accommodation. Knee-jerks exaggerated. Heart, lungs, liver, etc., negative.

Ophthalmoscope shows "cherry-red spot." Cerebrospinal fluid by lumbar puncture shows increased pressure. Wassermann test negative.

Father and mother living and well. Russian Jews, unrelated and strangers prior to marriage.

Strabismus	Occurrence in others of Family	Convulsions	Wassermann	Consanguinity of Parents	Nativity of Parents	Race	Cerebrospinal Fluid under Pressure	Marasmus	Condition
No	None	No	Negative	None	Russia	Hebrew	+	Yes	Died at 18 months
No	1 brother	No	"	None	"	"	Not taken	Beginning	Died at 14 months
No	1 sister	Yes	"	None	{ M. Roumania F. Russia	"	+	"	Died at 15 months
No	None	Yes	"	Grandmother's third cousins		"	++	"	Progressive
No	None	No	"	None	"	"	+	Marked	Died at 23 months
No	None	No	"	None	Russia	"	++	Beginning	Progressive
Right internal	None	No	"	None	"	"	++	"	"
No	1 sister	No	"	None	"	"	+	"	Died at 13 months
No	None	Yes	"	None	"	"	+	"	Progressive

### CONCLUSIONS

*Summary*—(1) Considering all of these cases have come to our clinic within so short a period of time and so few (only about 150 cases are reported in medical literature), one concludes either many such cases are not reported or many are not diagnosed in the short period of allotted lifetime of the patient.

(2) The use of the ophthalmoscope is absolutely necessary in finding the pathognomonic sign, "the cherry-red spot."

(3) All symptoms point to a congenital disease and not that of an acquired condition.

(4) Consanguinity noted in only Case V. and in the first cousins of Case III.

(5) Increased intracranial pressure noted by lumbar puncture in each case where taken.

(6) All cases occurring in Hebraic families.

(7) Hopelessness of any present knowledge of treatment to arrest the progress of the disease or to prolong life after the two years' limitation.

I desire to thank Drs. William Sharpe, W. B. Pritchard and W. W. Winters for referring these cases to me for study. Also, Dr. J. A. Kearney, ophthalmologist, for examination and reports and Dr. Y. C. Lott for assistance in performing the lumbar punctures.

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## SUGGESTED IMPROVEMENT FOR OUT-PATIENT WORK WITH CHILDREN \*

BY STAFFORD MCLEAN, M.D.

New York

So much has been written recently regarding projected improvement in out-patient work in general by such authorities as Dr. Goldwater, Dr. Cabot and Mr. Michael Davis of the Boston Dispensary that a word here on the subject of dispensary work with infants and children may not be untimely. The majority of medical men in large centers have devoted a part of their careers in gaining experience in the various types of dispensary. Many are engaged in such work at present. Those who are satisfied with existing conditions will not be interested in this paper. I do not address my appeal to the medical men who are willing to allow conditions to continue as they are at the present, but to those who are doing their bit, or have done their bit, in the dispensary and who feel that existing methods serve no useful purpose for either the physician, the patient or the dispensary.

Out-patient work in recent years, taking it all in all, shows steady improvement, not so much in small changes in all dispensaries, but in radical changes in a few. The few are not perfect, but the improvement of late has been so marked, in their striving for better results, that it is to be hoped their ideal will soon be realized.

Most of you are familiar with present methods. The dispensary chiefs change so often that it is difficult to associate the work of any one man with any particular dispensary. It is generally the proud boast of the last chief that the number of cases seen daily during his incumbency of office has been double that of his predecessor. It has never occurred to him to scrutinize his dispensary records, if of course there are any; he has never asked himself how many of these were benefited by their visit to the out-patient department, how many of these patients came to the dispensary for more than one visit, or how many correct diagnoses were made. The general scheme is for the doctor to arrive at the opening hour or as late thereafter as the keeping of his job will permit. A hurried glance over the

\* Read before the Society of Alumni of Bellevue Hospital, February 7, 1917. From the Babies' Hospital Dispensary.

waiting throng gives him a general idea of the speed he must develop to clear them all up in the time he has allowed himself, and the work begins. Incomplete examination or none at all, hurried, snap, guess diagnoses, poor laboratory work or none, slap dash and away the patient goes with a bottle of elixir, which at best will do him no harm.

He is too poor to pay for the services of a physician; in the eyes of the clinic worker too ignorant to understand directions relating to his medical condition, not sick enough to be admitted to the wards of the hospital, but wise enough to know that he will get as much relief from a bottle of patent medicine or the gratuitous advice of a lay friend as he will by returning in a week's time to the dispensary for more of the slap dash treatment.

How many physicians would enjoy the presence of their so-called Best Private Patient or the Dispensary Philanthropist in the examination room of the out-patient department when in a hurried hour they are clearing up the cases.

It might be well at first to take up the question of crowding, endeavor to ascertain the cause and perhaps suggest means to correct the abuse. We may assume with a fair degree of certainty that one-quarter of the population of large cities are potential subjects for dispensary care. In spite of the wage increase of late I have not noted any decrease in the number of out-patients. The various clinics are not situated with any reference to the density of population of the various city districts, so that in some the crowding might be termed sectional. In others the hospital has a reputation for doing good work and the patients are drawn to the dispensary in that quarter of the city in the hope that they will secure care of the same type that they or their friends have had in the wards of the hospital. In others it is the personality of the doctor in charge or whom they hope is in charge. He may not actually have the care of their case, but at least he will supervise the work of the younger doctors. As a consequence of this overcrowding with its careless methods, the patients become discouraged with the poor results and either resort to another dispensary, where they increase congestion, or fall back on the self-cure at home.

I am not going to speak of the remedy at this point in my paper, but it might be well to draw to your attention the possibility of having more clinics with more intelligent reference to



density of population or longer clinic hours with a shift of physicians. Either of these remedies would relieve the congestion and give the unfortunate who seeks free medical advice at least more of a run for his ten cents than he has had in the past.

It is not "How many patients are seen," but how well they are taken care of, which should be the boast of the clinic chief. Does the medical man ever figure up the economic loss of the wasted visit in the crowded dispensary? We all know that little can be done for the patient who comes but once; medicine has become such a complex science that it is practically impossible to do justice to any but the trivial conditions in one visit. If this is so, then the time spent on the "one visit" patient is entirely wasted. This results in great economic loss, due to waste of the physician's time who sees the patient, loss of the patient's time who visits the dispensary, and loss of time of the clerical force who keeps the records. Yet in spite of this statement I wonder how many dispensaries keep records of the number of visits made by each patient.

If the patient does not return for treatment on the day appointed, the visiting nurse should know the reason for the absence, and if the fault lies with the dispensary something should be done to prevent its recurrence. The average clinic worker will argue against such follow-up work and he will say, "If our dispensaries are too crowded at the present time, what will happen if we follow up all the 'one visit' cases and induce them to return for treatment?" If the only method of preventing overcrowding is to give poor service to those who seek medical relief, then the dispensary should be abolished. There are certain standards; if these are not lived up to there is entire failure. I am certain, at least as far as children's dispensaries are concerned, that unless they are very good they should be entirely abolished. In other words, the mothers would be wiser in avoiding medical advice entirely than to accept the care which the average dispensary offers. Does the fault lie with the dispensary physician or with the management which allows this condition to continue?

Dispensaries can be roughly divided into three types—those run in connection with hospitals, those in connection with medical schools and those without medical affiliations. It is only fair to say that there are excellent dispensaries in all three classes. Those managed in connection with hospitals are mainly

used as feeders for hospital beds and to some degree for the after care of discharged patients. Although it costs many times as much to care for a patient in a modern well-equipped hospital than it does in a dispensary, there is nothing definite done in a preventive way to keep the dispensary patients from entering the wards of the hospital.

If a child appears in the out-patient department with a well-developed rickets the assumption is that if the child's condition is not well taken care of in the out-patient department it may develop tetany and become a hospital charge for a number of weeks. If it does not enter the hospital whose out-patient department cared for it during its rickets it will surely be admitted to some other hospital. This is merely one example of economic loss.

If a case of influenza or one of the common types of dysentery is admitted to an out-patient service it seems likely that there are other similar conditions in that same family or in other families in the same dwelling. In any of these instances the Social Service Department might be the means of preventing many days of hospital treatment for a group of children.

There are a number of cardiac clinics in the large cities. If one compares the reports of patients with respect to hospital treatment before and after joining the cardiac clinic one is struck with the change. This only goes to prove that this same system must be adopted for all types of out-patient activity.

"Hospital fever" was the cause of the beginning of dispensary treatment. It was in London toward the close of the eighteenth century. Later on the quantity of "clinical material" going to waste prompted the idea of using these clinics for the students. The crowded medical school clinic of the present day is an outgrowth of that system. Those applying there for treatment who are fortunate enough to have a disease a little out of the ordinary are given the best of examination and treatment; the same may be said of those who have "good physical signs," but the vast majority are handled in the superficial manner so familiar to us all. Would it not be better to limit the number to the capacity of the attending physicians? Then they could all have the care they deserve. The students would benefit more from seeing all the cases handled well; they would not get the impression which prevails at present that anything is good enough for the majority of the patients seen in a dispensary.

The second type of out-patient department is the one affiliated with the hospital. There they are more likely to see the more serious types of ambulatory cases. Some are very good, quite in keeping with the reputation of the hospital. In others it is difficult to understand how the dispensary has fallen behind while the ward work has made great progress. The third type is the so-called independent dispensary, without school or hospital affiliations. In them I think medicine is at its lowest ebb. Why they are so crowded I am unable to state. It may be because there are no hospital connections and so the patient's dread of being cajoled into a hospital is removed. It may be because the physicians are salaried and therefore remain so long connected with the institution that they are well known to the patients. It may be because of the wholesale distribution of medication, which may or may not serve in lieu of examination. It may be one thing, it may be another; but in any event we know that they are pretty popular medical bazaars.

The attitude of the young physician to the dispensary and of the dispensary to the young physician is extremely important. One can almost divide the medical workers into three classes. Those who come with serious intent, hoping to do careful work and ambitious to secure a position on the staff of some hospital as soon as they gain sufficient experience to warrant their filling the position. They feel they cannot do their best work in an out-patient department and that it is simply a refuge until conditions better themselves for their medical outlook. Upon receiving a staff position they promptly drop the dispensary at a time when their services there would be really valuable. Instead of leaving at this time the position should be so attractive that they would be glad to remain. If the number of patients were limited, if the character of the work were on a higher plane with well-trained laboratory assistants and sufficient nurses to enable them to follow up all their cases, and a small salary, they could not be driven away. There is another kind of medical man who merely joins a dispensary for the prestige it gives him with his private patients. He lets them know in a casual way that he is attached to such and such a hospital, their knowledge of the management of hospitals would never expose the fact that his connection amounted to an hour's work three times a week. There is still another type of man who does good work during the clinic period, but who lacks a definite medical



aim; he goes from dispensary to dispensary, spending a few months in each, apparently with the idea of scratching the surface of all the specialties. Both of these men should be eliminated from out-patient work. With the present lack of system they cannot be dispensed with. Each in his way helps clear out a few of the waiting patients and so helps the chief finish the day's work.

I have referred to the relation of the dispensary to the physician, to the student, and in a casual way to the hospital. It seems most opportune at this point to say something of the duty of the dispensary to the public. I trust I will not be accused of playing reformer when I say that the existing order of things cannot go on much longer or the desire of a change will come from without rather than from within. The public is becoming educated medically, and as soon as it comes home to them that a quarter of the population of the large cities which seeks medical relief in dispensaries is being cared for in a rough and ready fashion they may insist on legislation for relief which will neither be suitable for them nor for us.

The man who earns but eighteen dollars a week is forced to send his child to a dispensary rather than pay a dollar or less to a private physician for an office treatment. The smaller the fee, the quicker the examination and perhaps also the shorter the period of relief. If the child of the two-fifty a day man happens to get in the hands of a good dispensary, the ailing infant receives a proper examination; if need be a blood and urine examination, carefully written directions for treatment and care at home and most likely a visit from the visiting nurse, with further directions and demonstration as to preparation of food and care. The child does well and the mother is naturally satisfied with results. Another woman living in the same tenement whose husbands' earning powers are fifty cents more a day has a child with the same medical condition. She takes her child to the corner doctor who, after a few routine questions and perhaps a superficial examination or none at all, tells her to go home, give the patient a teaspoonful of his favorite medicine three times a day and states that it is teething, but it will shortly begin to mend. He has not gone into the child's condition with any thoroughness, the question of diagnosis has been of the hit and miss variety, and in this case he has missed entirely. The woman airs her troubles and she hears how the



other child was treated at "The Ideal Dispensary." Must the woman whose husband's earnings are three dollars a day be deprived of good treatment for her child? If so, why? The one dollar practitioner will say that therein lies the abuse of the dispensary. I do not propose to take away the living of the physician who practises among the working people, but I do think a method should be provided him whereby he retain his patients and at the same time they receive better treatment. In most cases he deserves the respect of those whose practice lies among better and happier surroundings, his devotion to his patients, his difficulties in having his orders executed, his lack of nursing help and his numberless night calls merit our sympathy rather than our reproach. On the other hand, medicine has become so complex that it is not within the power of one man to give the proper medical services without the help of colleagues, whose services are expensive to the patient.

It is difficult to suggest a practical remedy. It seems possible that the pay dispensary may solve the problem. There, the patient of very moderate means may get the services of a group of specialists at a moderate fee. The fee will pay the dispensary costs and give the physicians in attendance a salary. When the diagnosis is established and the treatment outlined the patient will be referred back to his physician. This is done in a modified way at the Massachusetts General Hospital. This system could be used both with children and adults. The fee charged would have to be higher than that of the private physician otherwise he would be ruined by better services for less money.

If the dispensaries were developed to the point of maximum efficiency there would not be the need for so many hospital beds. About this time of year the wards of most children's hospitals are crowded with pneumonia patients. If the lay public knew more about the prevention of pneumonia there would be fewer cases and some of the funds used now in the hospitals could be diverted to the dispensary. The same can be said of many diseases of an infectious nature as well as those due to the hazards of labor, the occupational diseases, etc. This summer there was a great deal in the New York newspapers about infantile paralysis. The news was so interesting to the public that for weeks the details of the progress of the disease was a headliner in the daily press. A great deal too much was published. At the end of the publicity campaign the public knew quite as much

about the disease as most physicians. I do not know whether this information was good for the people or not, but I do know that the general health of children in the past summer was much better than in previous summers. This means that people took better care of their children and avoided conditions that might have been the cause of disease. If the preventive campaign carried on in the newspapers can be the means of preventing disease, what might the combined efforts of the physicians and the social workers in a well-ordered dispensary do along the same lines. They would have the opportunity of giving advice to fit the case, rather than the reverse of this, which is the way of the newspaper campaign. I venture to state that the milk stations in New York City have done more for the prevention of disease among infants and children than all the rest of the group of enterprises for the care of both sick and well children. I think their work can be improved. I believe they retain a great many infants who would receive better care in a dispensary accustomed to the handling of sick infants. The secret of their success lies in the fact that they attempt to prevent disease rather than to cure it. They are up with the spirit of the age. Let us hope that the mother of the immediate future will be trained in the habit of bringing her children at regular intervals to a dispensary. Conditions unsuspected may exist, the prompt discovery of which may prevent many unnecessary days of illness. If they are able to pay a fee they may be entered in the pay dispensary described above; it may even be arranged on a yearly basis, as is done with the students at the University of California. The Mayo Clinic is a shining example of what may be accomplished in the group method of treating disease. There is no reason for believing the Mayos have associated with them a more intelligent or better trained set of men than could be associated in any large city in this country. I believe that medical activities in the future will lie along these lines—the medical center for diagnosis and the private physician for the follow-up work.

I am making many critical comments on dispensary conditions. It is much simpler to criticise than to make remedial suggestions. As my experience in out-patient work has been entirely with infants and children I will confine myself to suggestions for the operation of a dispensary dealing only with them. If possible, it should be connected with a hospital with

beds for children, but if this is not feasible some minor changes may be necessary in the way of management. If the children's dispensary is part of a general service under a medical school management the problems will be even simpler.

A certain equipment is essential. A laboratory with a well-trained bacteriologist and serologist. An X-ray department is extremely desirable and almost a necessity. There are also other essentials in the way of providing comforts for the patients. Automatic devices for the supply of napkins and towels. An apparatus for heating feeding bottles, etc. The medical staff should consist of an admitting physician, the clinical chief and his assistants, among whom should be numbered a laryngologist and otologist.

The first and foremost change must be made in the keeping of the dispensary records. The histories must be filed exactly as they are in the well-conducted general hospital, the diagnoses indexed and the complications cross referenced. The same type of history sheet should be used in the dispensary as in the hospital. The records should be interchangeable and the records of both the wards and the dispensary filed together. This will give both branches of the hospital familiarity with the work of the other and incidentally the cross scrutiny will help both services by stimulating them to more careful work. With this method much valuable time might be saved, and it would work to the advantage of the physicians of both services, not to speak of the advantage to the patient. It would materially shorten the number of hospital days of every patient, because the inside man would know that the treatment begun in the hospital would be continued without an interruption. It would also encourage the outside man to have the child admitted to the ward at the earliest possible moment rather than at a time when perhaps hospital treatment might be unavailing. The patient should also be readmitted after a discharge on probation without a new history, physical examination, etc. The question of having every case made a new case after three months' attendance at the out-patient department is to be considered; this is merely another method to prevent the men from going stale on routine cases. The records as to the number of visits made by every patient and their promptness in returning when directed is a most important feature of out-patient work. The follow-up card in use at Johns Hopkins and the Massachusetts General answers every



requirement. This card is attached to every chart and the physician indicates with a mark when he expects the next visit of the child. These are collected upon the completion of the clinic and filed according to date, so that the nurses of the follow-up department on going through the file each day know the cases expected for further treatment. If they do not appear upon the day appointed the nurse mails a post card with a reply card attached, asking why the patient has not returned upon the indicated day. If the reply is satisfactory she appoints another day for a visit. If there is no reply she makes a follow-up call. If possible every home is investigated with the idea of ascertaining living conditions and conditions of health among the other members of the family.

As I have stated above, the quality of the staff has much to do with results accomplished. In order to get good men there must be an opportunity to do good work. The best dispensaries have a waiting list. No man should be accepted who will not promise to remain at least a year. It takes about that length of time to make him entirely useful and it seems poor policy to allow a man to leave at the very period he becomes useful. If he sees that he is making progress he is likely to wish to remain.

The director of the clinic should have a position in the hospital wards; this will give him a broader point of view and enable him to judge the type of case to be admitted to the wards. He will not have any of the routine work, but will devote his time to superintending the work of the younger men and helping and directing them in their care of their cases. He will not be salaried. His compensation will be in the honor of the position and the great experience derived therefrom. The assistant attending physicians will work under the direction of the chief; they will be recruited from the men who have had one year's experience in the dispensary. They will have a salary. It is often said that the earnest medical man will do just as good work without any stipend. This is the very reason he should have one. It only goes to prove that it is a help and not a bribe. The young lawyer serving his apprenticeship in the office of the well-known attorney and spending most of his time searching data in the law library is given a living salary. Why should the physician who is doing more difficult work be compelled to labor merely for the experience. A salary would solve many of his



problems and also make him more amenable to discipline as regards attendance.

If the one-year man or volunteer after twelve months of service does not prove himself capable of working up to the standards set by the dispensary he should be released and his position given to another.

The question of limiting the number of admissions is a very serious one and cannot be solved without serious thought. If all the dispensaries taking care of children did good work the problem would be simpler, but with some good, some fair and others poor it means that we must either bring them all up to a certain standard or work out a problem for eliminating the poor ones. The poor ones cannot be eliminated at once, so some arrangement must be made to make the good ones more effective. By having more physicians and longer admitting hours more patients could be taken care of. By having a better social service department the cases would not have to be seen so frequently. One man cannot properly care for more than one child every ten minutes; some old cases would take less time, some new ones would take much longer. At all events if the good dispensaries take care of all the cases they can properly examine and treat and refuse to see the others, it will soon create a demand for more dispensaries of the best type. This demand will force the poor ones to raise their standards and perhaps be the means of creating new ones. Dispensaries for those who are able to pay will also help solve the problem of congestion. If all the people got the proper medical attention there would be less illness, especially among the poor, and in consequence there would be less congestion at the dispensaries.

I wish to say another word about the importance of having an admitting physician in every children's dispensary. Allowing sick children to sit side by side in the waiting room of an out-patient service is neither sane nor necessary. The child may come with a simple cold and in the waiting room contract any of the infectious diseases. Another may be a feeding case and contract a cold which may terminate in pneumonia. There is no good in preaching preventive medicine if even the prospective patients are subjected to these abuses.

Besides making a tentative diagnosis on all cases seeking admission, the examining physician will have other duties. As children's dispensaries are managed at present they only plan to look after medical and perhaps the very minor surgical con-

ditions. A great many apply for admission with conditions which could be more successfully treated in a hospital with special facilities for their care. Others apply in the first stages of one of the infectious diseases. The first-named group are forced to wait for an hour or more before they are told that they will be better off in another institution, but their condition should be discovered by the admitting physician, who will give them definite directions about finding the place where they are to be referred with careful explanations as to why they are refused treatment. I suggest giving each mother the directions written on a printed post card, which will be deposited in the mail by the doctor in the other institution who sees the case. This will enable the out-patient department which refers the case to learn of the final disposal. If the card is not received through the mail the social worker will know that directions have not been carried out and she will hunt up the mother and find out why. The admitting physician will have to be paid a salary and to make the position more attractive he must have the run of special lines of cases after his regular admitting hours.

Many patients of ordinary mentality or with a meager knowledge of English or none at all are refused admission to various philanthropic agencies with the briefest of directions as to the whereabouts of the hospital where they are being sent or the reasons for their transfer. Unless the whole thing is made quite clear to them they are likely to be discouraged and discomfited and return home without the relief which they may sorely need. The services of a clerk should be available in every dispensary, one of whose duties should be the answering of the many letters which accompany patients. Many of these notes of introduction are prompted with the idea of doing something for the patient's welfare; many are sent in the hope the hospital will make a diagnosis which will help the attending physician in the tenement district carry out proper treatment begun by the dispensary doctor. No attention is ever paid to these notes, except in the way of careless and unthoughtful criticism by the dispensary worker, who, perhaps unmeaningly, destroys a well-founded faith which the patient has for her private physician. The least that might be done is to answer these notes and inform the physician of the diagnosis and the outlined treatment. This would result in a better understanding and the coöperation would help the patient and the dispensary.

One more word about the dispensary worker, whose efforts

in a large dispensary may not be carefully supervised and who because of this is likely to substitute some of his own pet methods of treatment for those which are accepted as good by the medical management. These pet ideas may be good, but it is better to allow those in authority decide the question of their value. This can be done at the monthly conference, where the younger men will have a chance to present their views and be given a hearing. At these same sittings the chief will have an opportunity to state his views on the newer developments in medicine and point out a use for those applicable to out-patient conditions. It might also be useful to have conferences in the larger cities of all those working along similar lines in the various dispensaries.

The man who enters the practice of medicine to-day should have a broader viewpoint than his colleague of twenty-five years ago. Legislation toward health insurance is pending; within the next decade it will surely come in most of the states. Rather than resent its approach we should try to prepare the way. One of the means of doing this will be radical improvement in the management of dispensaries.

*776 Madison Avenue.*

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NUTRITIVE VALUE OF BOILED MILK—The experimental work involved in a report by A. L. Daniels, S. Stuescy and E. Francis (*American Journal Diseases of Children*, 1916, Vol. XI., 54) is the result of an attempt to determine the comparative nutritive efficiency of milk heated to different temperatures. Their results point to the conclusion that milk heated to the boiling temperature or thereabouts is an inadequate food. Rats fed on boiled milk grew to about half their normal size. Although they were able to keep these experimental animals for many months on boiled milk, in no case was there reproduction, nor did any of the animals reach the normal weight for adult rats. Milk which is kept at the boiling temperature for forty-five minutes is no less efficient as a food than milk boiled for much shorter periods—ten minutes or one minute. The chemical changes which make heated milk an inadequate food are brought about at the boiling temperature or thereabouts. The value of pasteurized milk as a food, therefore, will depend on the temperature to which it is heated during the pasteurization process. Heating milk to a higher temperature than boiling (114C.) makes it even less valuable as a food.—*American Journal of Obstetrics*.

## TUBERCULOSIS FOLLOWING RITUAL CIRCUMCISION\*

BY MARK S. REUBEN, M.D.

New York

Milton H. came to our notice at the Vanderbilt Clinic on November 11, 1916, at the age of nine weeks. On the eighth day he was circumcised by a mohel, who aspirated the wound by means of a glass tube; within a week the entire wound of the circumcision had healed. Five weeks after the circumcision had been performed, the mother noticed a swelling in the right groin, and it was for treatment of this swelling that the infant was brought to the clinic. The same mohel who circumcised the patient had previously circumcised 2 other boys in the same family; the boys are respectively seven and five years of age and are both well.

Physical examination of the child was entirely negative; the spleen was not enlarged; the lungs were negative; the inguinal glands in the right groin were enlarged; the whole mass being about the size of the small finger; there was also swelling of the left inguinal glands, but not to the same extent as on the right side; examination of the penis, on casual observation, presented nothing abnormal; the circumcision wound had completely healed; there was no ulceration; on closer scrutiny we could see four small tubercular masses (each one separate and distinct—about one-eighth inch in diameter) on the anterior surface of the circumcision scar; the frenum was entirely free of any infiltration; on palpation of these little masses one obtained the feeling not unlike that of shot under the skin; they felt hard and indurated. We excised the largest of these tubercular masses, and microscopical examination by Dr. Willensky showed that the tissue was infiltrated with numerous tubercles and diffuse tuberculous inflammatory tissue; the von Pirquet reaction of the infant was positive; examination of the mohel showed that he was suffering from advanced tuberculosis and his sputum was loaded with tubercle bacilli. In the two weeks after we had first seen the infant it had gained about one pound (from 10<sup>11</sup>—11<sup>0</sup>) and never had any fever. Excision of the tuberculous tissue of the penis

\* Read at the New York Academy of Medicine, Section on Pediatrics, December 14, 1916.



and the inguinal glands of both sides was recommended. Tubercles of the skin were not present.

A review of the literature shows that there are reported 42 cases (including our case) of tuberculous infection following ritual circumcision. The incidence of such infection must have been greater and many cases have probably not been reported. It seems reasonable to suppose that the same operator (mohel) would probably infect a majority of the infants on whom he performed circumcision; because the tubercle bacillus is found fairly constantly in the mouths of tuberculous patients. We were anxious to follow up every infant who was circumcised by the mohel in



M. H. Showing good nutrition of infant as long as the disease is localized

the last year, but on inquiry we learned that our patient was the only one operated on by him in the last eighteen months; and this was done only at the urgent request of the mother.

In 37 cases the wound was sucked in the usual way; in 3 the wound was sprinkled with wine from the mouth of the operator; in one a dressing was applied to the wound on which wine from the mouth was poured on; in our case the wound was aspirated through a glass tube.

In 2 of the cases there was a history of tuberculosis in the family (mother and grandfather respectively); however, in every case the mohel presented evidence, clinical or bacteriological, of tuberculous infection. Tubercle bacilli were found in the sputa of four operators (cases of Elsenberg, Debrovitz, Holt, Reuben).

The first symptom is infiltration and ulceration of the wound area; in the majority of the cases the wound never healed completely; in 3 cases ulceration and infiltration had developed after the circumcision wound had completely healed (Lehmann, Eve, Reuben). The infiltration takes place from seven to fourteen

days after the operation, in the form of small, hard, indurated tubercular masses, which gradually ulcerate; the ulceration usually begins at the frenum and is progressive; it may extend to the abdomen; in one case it led to total gangrene and destruction of the glans. The earliest ulceration was observed in the case of Holt (on the seventh day).

From two to eight weeks after operation, enlargement of the inguinal lymph glands takes place; the enlargement is usually greater on one side than on the other; gradually these glands enlarge and soften; suppuration due to mixed infection takes place and in the majority of cases within two or three months after infection they break down.

Systemic infection rarely occurs before the fourth month after the circumcision. Without a single exception every case, whether it recovered or died, showed tuberculous involvement of other tissues, glands, or organs. The systemic manifestations of tuberculous infection were in the form of tuberculous spondylitis dorsalis, tuberculosis of radius, tuberculosis of hip and pelvis, tuberculous mastoiditis, pelvic abscess (cold), tuberculous cervical adenitis, cold abscess of abdomen, cold gluteal abscess, tuberculosis of knee, etc.

Of the 42 cases reported, 11 recovered, 16 died and of 15 the final outcome is not known. Death usually takes place at about one year of age; the earliest death reported is in the case of Holt, at the age of three and one-half months; the oldest death reported was at 3 years from a tuberculous spondylitis complicated by a compression myelitis.

The cases that apparently recover invariably show tuberculous manifestations of bones or glands in later life; in these cases the ulceration on the penis and the suppuration of the inguinal glands usually continue and do not heal for from four months to four years after circumcision.

The prognosis is best in those cases in which early suppuration of the inguinal glands takes place and which are operated on by curetting or excision.

In the days before the tubercle bacillus was isolated, the diagnosis was made on a clinical basis. In the cases of Elsenberg, Debrovitz, Meyer, Hofmohl, Ware, Kakles, Finney, Arluck, Holt and Reuben, sections or smears from involved tissues showed the tuberculous nature of the disease. In the case of Eve, pus from the wound was injected into a guinea pig which promptly died of

tuberculosis. The von Pirquet reaction of the infant was positive in the cases of Kakles, Holt and Reuben; the von Pirquet reaction was negative in the case of Arluck (due to exhaustion of infant). Tubercle bacilli were isolated from tuberculides of the skin only in one case (Holt).

Autopsies were performed on the cases of Arluck and Holt. In both cases general miliary tuberculosis of all the organs was found. There were found tuberculosis of the lungs, bronchial glands, the liver, the spleen, the mesenteric glands, tuberculous ulcers of the intestine, tuberculosis of the brain, mediastinal glands of the heart, of the coronary artery, of the peritoneum, of the bladder, etc.

The course of the disease may be described as follows: From seven to fourteen days after circumcision, the wound which in the majority of cases does not heal ulcerates and begins to discharge pus; from two and one-half to eight weeks after the circumcision the inguinal glands become enlarged; on one side usually more than on the other; in the majority of cases these glands suppurate and break down. The majority of these infants die at from three and one-half months to three years after the infection; the most common causes of death are tuberculous meningitis or general miliary tuberculosis; those who recover invariably present other manifestations of tuberculosis in later life (tuberculosis of bones, lymph glands, cold abscesses). The treatment of these cases is early excision of the tuberculous tissue of the penis and the inguinal glands on both sides.

Author	Number of Cases			
	Reported	Recovered	Died	Unknown
Lindemann .....	2	1	1	0
Lehmann .....	10	3	7	0
Elsenberg .....	4	0	1	3
Eve .....	2	1	0	1
Debrovitz .....	4	1	0	3
Gescheit ... ..	5	0	3	2
Meyer .....	1	0	0	1
Hofmohl .....	1	0	0	1
Kolizew .....	7	3	2	2
Ware .....	1	0	0	1
Kakles .....	1	1	0	0
Arluck .....	1	0	1	0
Finney .....	1	1	0	0
Holt .....	1	0	1	0
Reuben .....	1	0	0	1
<b>Total</b> .....	<b>42</b>	<b>11</b>	<b>16</b>	<b>15</b>

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KETONES AND BETAHYDROXYBUTYRIC ACID IN THE URINE OF NORMAL CHILDREN—A number of urines were studied by B. S. Veeder and M. R. Johnston (*American Journal Diseases of Children*, 1916, Vol. XI., p. 291) to determine whether or not ketones and betahydroxybutyric acid were present, and, if so, in what quantities. The method used for determining their presence was that of Shaffer, in which the acetone and the acetoacetic acid are first distilled over, and then the betahydroxybutyric acid oxidized by potassium bichromate and distilled over as acetone. The amount of acetone is then determined by the iodimetric method of Messinger. The twenty-one children from whom the twenty-four-hour specimens examined were obtained were what is usually termed "normal" with a few exceptions. Small amounts of ketones and betahydroxybutyric were always found in the urines of these normal children when their caloric requirements were fully covered by the diet. The amount was small and varied from 20 to 100 milligrams in terms of acetone in twenty-four hours. The average amount excreted was from 50 to 80 milligrams. The age, sex and body weight of the child apparently had no effect on the amount. As a rule, the amount of betahydroxybutyric acid was somewhat greater than the amount of ketones, but this did not always hold true. We must regard these substances as present in small amounts in the urine of normal children. The large quantity of "acetone bodies" in the urine in febrile conditions and on restricted diets is due to the increase of substances normally present, rather than to the appearance of abnormal substances.—*American Journal of Obstetrics*.



## HISTORY OF PEDIATRICS IN NEW YORK—III.

BY ABRAHAM JACOBI, M.D.

New York

I promised to prepare for you a history of pediatry in New York City. Maybe I made a mistake in so doing, for I cannot help speaking of myself in connection with that task which includes hygiene and diet predominantly. Much of what I have been engaged in concerns itself with those most important topics. I have also studied and taught them. Milk was with many of us, as it is with you, a serious study, more so from year to year. From the time when we had nothing but the rotten milk of the Long Island manure heaps of sixty years ago to the vastly improved secretions of to-day the milk problem has required incredible exertion by Percy and many others.

The burning summer of 1854 furnished me an experience which lasted forever in my memory. At the corner of Chrystie and Hester streets I left a dying baby—not the only one of my numerous victims of the murderous temperature. On the sidewalk I met two colleagues, whom I asked in my despair what I was to do. Dr. Joseph Kammerer quietly said: "You are killing your babies by feeding them on what we call milk; stop that." Dr. Henry Schweig, the other man, said: "Stop milk and everything else for twelve hours, or even a day; that is the only way for a possible recovery." I learned from both; they saved many babies for me.

From my early time I fought the feeding of raw milk. I have been very successful with that plan; indeed, so much so that I admit with pleasure that the men and women who preach straining and boiling or pasteurizing, with the exception of a few, do not even remember at this late hour my name in connection with it.

A few weeks ago, however, a Chicago colleague of pediatric ambition, who again has written one of his papers on that subject—Dr. Brennemann—has been able to quote me and a small number of his recent friends. From this I have learned that the gospel of boiling has found followers and even prophets.

In connection with the question of the wholesomeness of milk, however, we should not overlook the advantage pediatry, or rather let us say the child world, owes to the indefatigable

work of a layman who in his own person has done more than you, or I, or all of us. Mr. Nathan Straus has travelled over many countries in the interest of what was to him a gospel. He has spent much of his money, energy and health to convince doctors and academic teachers and mothers and educators of the correctness of his missionary convictions. His thousand lessons of pasteurization have been taught by him with the result of convincing you and me that this apparently fanatic man has been wiser than most of us, and of our erudite colleagues of all countries. As usual, those of Germany have been the last to be converted. But converted they are, at last.

My teaching of the necessity of cereal decoctions as an addition and as a corrective of milk has won many favorable criticisms and imitations, for instance those of my famous friend, Henry D. Chapin. I have often been told by those who write books that cereals are practical, really practical.

I am also informed and have read papers with information that my teaching of the use of cane sugar in place of milk sugar is finding favor even in America, also that the gospel of fat-feeding is no longer sustained by those who have enough fear of acidosis and diarrhea and indican as long as the victims are only other people's babies, dead or dying, and that there are those who are satisfied with Jacobi's 2 per cent. fat mixtures, as long as the survival of babies is the practical point of view. All these things I had taught in schools and papers and lectures long before 1870, and in a pamphlet I prepared in 1872 for the Board of Health; in a small book with the title, "Hygiene of the Child," in 1874; in a larger book on Intestinal Diseases in 1887; in the first volume, 1875 and 1882, of Gerhardt's wonderful Handbook; in Buck's Hygiene, etc., and other productions.

My treatise on Infancy and Childhood appeared in 1896, 1900 and 1903. Hard work of all sorts prevented me from preparing new editions. That is why I stopped the sale of the book altogether. I was of the opinion that a few of the American text books which were really good satisfied the actual needs of the market, not to speak of the needs of the more numerous authors. I am pleased to know that this is so, and that the large number of bad books could do no such harm as the good books of Holt, Rotch, Kerley, Sachs, and a few monographs such as that of Brothers would be useful and beneficial. It is indeed more

important that pediatry should thrive, no matter whether Jacobi would be one of those whose name would be one of those who should not be forgotten. Personal ambition is not in my line; with the men who concoct books by the aid of other books I have little sympathy. They may be forgotten in 250 years like myself. Besides, there are books emanating from other cities, and cyclopedias like that very good one of John M. Keating, of thirty years ago.

It has taken a few years only before a number of journals supplied the want of magazines. In 1868, with Benjamin Dawson and Emil Noeggerath, I started the *American Journal of Obstetrics and Diseases of Women and Children*. You all know it well, and its many meritorious volumes of this last half century. I continued my personal editorial work a few years only. You are well acquainted with the *ARCHIVES OF PEDIATRICS*, founded by William Perry Watson in 1884; with *Pediatrics*, founded by that meritorious worker, Dillon Brown, 1895; and the *Journal of the Diseases of Children*, undertaken five years ago by the American Medical Association. You know that a vast number of contributions has been furnished by you and your colleagues of New York. Some of these magazines are clean and thoroughly ethical. No advertisements, if any there be in them, are of an unethical nature; nor are there the vast number of alleged scientific papers and criticisms of proprietary medicines, foods and compounds, which fill many columns of European magazines mostly "made in Germany." It is mainly German so-called literature which furnishes the undesirable advertisements of pretentious materials and other culture—"Kultur."

Among the results of my experience I recall a few which are appreciated by many.

From my papers on the tonsils and their dangerousness and their exaggeration, I count this which here follows. There is much that is overdone. The tonsils are not always as dangerous as they are made out to be. Most of them may remain where they are, removed, like ovaries for instance.\* So I have often expressed the opinion that many tonsils were quite comfortable

\* It was forty years ago, in a public meeting in the presence of a few dozen ovaries exhibited in a jar, that I claimed that I knew of a better place for ovaries than this jar, and was asked which one, and said it was the pelvis of a woman! I was not praised for that.

in a child's fauces and a boy around them. Indeed, I believe that too many tonsils are removed in pediatric malpractice; too many are *exsected* in place of being *resected*. That is part of what I have learned a hundred times and have taught. Tonsils are not so preposterously dangerous, not even when you find tubercle bacilli in the crypts. As a rule, they are not absorbed from them; there is no, or very little, communication between them and the system. Those who know the anatomy of the tonsil know that too. But what is dangerous is the infection which takes place in and from the ring of Waldeyer. That is why the infected tonsil of itself does not give rise to the vast streptococcus swellings on one or both sides.

In connection with my observations on diphtheria my attention to the throat and nose has been increased. My first paper, published August 11, and 18, 1860, had observations which are simple and practical. A healthy nose and throat are real possessions. I have always taught to keep children's noses and throats clean. What I taught sixty years ago I am teaching now. Warm saline solution is the best cleanser. Boracic acid solution, rarely bichloride solution, 1:10,000 will sometimes take its place. No atomizer and no dropper and only for certain essential indications a syringe may take the place of a nose irrigation. A Whitall Tatum No. 10 nasal douche, or, for small children, an E. Kretz Owen douche is safe. My specialist friends have frequently told me by irrigating the nose the ear is endangered. That is, theirs might be, never mine. I never injure or endanger an ear as long as no snuffing up is permitted. Let the head be bent backward, keep the mouth gently open, and allow the irrigated water either to be swallowed, or rather be emptied through the mouth. Children will learn how to do it correctly, provided the mother or nurse will remember "*no snuffing up at any time*," and provided the doctor will remember it, even the specialistic doctor. Two daily irrigations, *without snuffing up*, keep the nares clean and healthy. And clean nares keep lymph vessels clean and prevent sepsis. Warm saline solutions are superior to strong salts or antiseptics or solutions of chlorates (potassium or sodium).

Potassium chlorate has been used and abused a great deal in this country before its *safe* use was known. I began to teach my warning in 1860. My friend, Dr. Fountain, of Davenport, Iowa, employed an ounce and killed himself, by swallowing it.



Stille has his history in his "Materia Medica." About the same time I took a dose of  $\frac{1}{2}$  ounce myself and contracted a nephritis, but did not die. Its effect, indeed, is to cause a nephritis. Marchand, of Leipzig, found the first effect of its use to be the change of hemoglobin into methemoglobin; and the curdling of the blood so as to cause thromboses and death. It caused a good many deaths until and after the profession was sufficiently instructed. Not sufficiently, for now and then a journal will still report a fatal case. In my practice I never met one, for I learned from other accidents. The doses are as follows: Small and frequent. In stomatitis, catarrhal and ulcerous, or in its combinations, even streptococcic, a child of three years may have from 15 to 20 grains in twenty-four hours; about  $\frac{1}{4}$  to  $\frac{1}{2}$  to 1 grain in one-half or one teaspoon of water every hour, one-half hour, or one-quarter hour. In diphtheria and other bacillary or septic infections the same doses may be employed with tincture ferri chloride in water, and glycerin or syrup. Many babies prefer the latter.

Such combinations have long been sold by some apothecaries as Jacobi's mixture, even to this very day. The tincture must be administered in frequent and small doses of  $\frac{1}{4}$  to  $\frac{1}{2}$  to 1 drop, and not followed by water, for the sore fauces should have the benefit of the local effect. In connection with that subject I suggest a remark on the growth of chronic catarrh of the nose and adenoids. My advice to the specialist is to remember that no relapses are apt to return when after a nasal operation one or two daily irrigations have been made. Our methods of operation have been improved everywhere, and our ambition is solicitous; but sight is lost of the value of after-treatment. This after-treatment is cleanliness, or it may be of different nature. Maybe you will be profited by my experience as a mere general practitioner.\*

Among the many opportunities I owe to the generosity of my professional brethren are the endless observations of masturbation in the infants, both male and female. When in 1874 I published a paper on the subject it was quite a surprise. Some magazines thanked me, *their* authors were mostly educators; some

\* For instance, my method of prolonged methylene treatment should follow carcinoma operations. I am not so dexterous as they are at present, and as I wish I were, but specialist operators are not so successful as I wish *they* were. Now I am a doctor and not in league with undertakers, and I talk to you the fiftieth time of methylene blue in the way I told you in the Journal of the American Medical Association ten years ago.

letters came from mothers and aunts who called me names for libeling their pets. When after years their doctors told them the old man was rather correct and meant no harm, and the effects of the bad habit did not necessarily lead their babies to h—l, the waves of resentment and wrath smoothed down. But that took long. Fortunately, indeed, temporary onanism is not so grave as anxiety paints it. Infants, children and adolescents are not damaged irrevocably, except in very bad cases. Neither in the child nor in the adolescent is the danger to the nervous system hopelessly bad.

Many of my hygienic efforts have been utter failures. Sometimes it was my fault caused by my lack of patience or incompetence of teaching. One of the reasons why I was expelled from a public institution was, my insisting upon the babies of three or more months to be washed with cool, and in the summer with cold, water.

Another, that I removed heavy velvet curtains from the beds of the babies. They were the pet arrangement of an elderly lady trustee, who knew of no better way to get rid of flies. If I had been twice as old as I am to-day I should have been more patient with the old lady; but I was not, neither quite so old nor patient. Besides, the irate mother and nurse refused to use fly-paper or poison to kill flies.

A very bad mistake of mine nearly fifty years ago was when the heat was broiling I advised the babies to be kept in their rooms, with no clothing, and open windows, when not taken outside. From one pulpit at least I was sent word that these were Christian babies, and they must be dressed.

In one of my recommendations in a very hot summer I made the proposition to give the broiling yearlings one-half or one teaspoonful of whiskey daily, in large quantities of water. I never recovered from that crime, at least in the opinion of those who knew everything better.

Once I was admonished to give lime-water. You know what it is, viz.: 1 lime in 780 water. A teaspoonful of lime-water containing  $1/12$  grain of lime is a frequent addition, now and then  $1/4$  grain, to one-half to one cup of milk. I meet that prescription and practice quite often at present. Mothers or nurses do that sort of thing. I forgive them and pity the babies. But when doctors do it I again pity the babies, but do not forgive the doctors.

When old ladies believe in the efficacy of hot chamomile tea, no matter whether they mean roman or vulgar flowers, in fever and in bellyache, you hope that not many of that class of old ladies are left. I have survived them.

It has not been my ambition to fill other doctors' shelves with books. The average book has not always added to the building up of solid scientific material or practical results. I have been and am in the practice of medicine with the object of saving people in danger of death. You cannot buy any of my books; they have been withdrawn from the market and you will rarely care for the task of looking up my pamphlets and journals. Still, among the subjects occupying the attention of New York pediatricists, renal diseases have been prominent. In the Medical Weekly Journal of 1896, January, I published an article on nephritis of the newly born, which has earned, I believe, a permanent place in our literature. The discussions on pyelitis date also nearly from that time. Pyelitis was considered a rare occurrence before that time. We have reason to enjoy the fact that a large number of young medical men participated in the new work of this new section of yours.

One of the subjects of your studies has been infantile scurvy. With it many of your names have been connected either individually or in collective essays; mine, perhaps, less than many of yours. At least I have written little. But what I have often taught I have proved quite lately. Some of you will remember that neither raw milk, nor boiled milk, nor pasteurized milk, nor carbohydrates, have ever impressed me as being the only or the prominent cause of scurvy. But what I always urged upon you as the most frequent cause of scurvy is the persistence of *uniformity* of food, and thereby the feeding with one and the same food. In writings and lectures I have caused you to remember that *no* natural feeding, unless improperly handled by us, the impertinent *homo sapiens*, is *uniform*. Cow's milk and others, and woman's milk, are not uniform. But artificial, routine-made foods, with or without officious formulæ and drummers, are claimed to be uniform. Nature's foods are not uniform; proprietary foods are made to be so. That is why scurvy is more frequent amongst the rich or well-to-do than amongst the poor. They can afford to pay for uniform foods, accompanied with impertinent lectures and formulæ for us, the ignorant practitioners. That is why in exceptional cases *even* breast milk when

accidentally uniform and mostly thin may cause scurvy. Within a few weeks I have met with a remarkable case which proves my, not theory, but knowledge. A baby of a year, poorly fed and developed, starved, almost marasmic, was admitted in the Jacobi Division of the German Hospital. Some of the doctors, a few who had studied "Eiweissmilch" in hundreds of cases with Finkelstein, and knew all of its beneficence, proposed that albumin milk. The baby delighted them all week after week. Nutrition, weight, notably improved. It was a grand and instructive case. What more do you want? But lo and behold! After three weeks of steady improvement under the same successful uniform treatment there was a *scurvy*. It was rapidly cured by relieving the baby of eiweissmilch, and returning it at the age of twenty months to raw milk, orange juice and meat soup. The baby is now doing well.

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PROTECTION OF INFANCY IN FRANCE—A. Pinard (Ann. de gyn. et d'obst., March-April, 1916) continues his account of the results of public care of the "war babies" in Paris. His first account was of the first five months of the war. The present one includes an entire year. The work included the care of every woman known to be pregnant whose husband was at the front, who was a war widow, or whose child was the result of a conception with a soldier out of wedlock. The accommodations in maternity hospitals were increased, advantage was taken of all private charities in this line of work, the distribution of sterilized milk was much increased, and homes were provided for nursing mothers who were homeless. The results of this care have been a decrease in mortality of infants at birth and of puerperal women; a diminution of mortality of infants between one day and three years of age; a lessened number of abandoned infants; and an increase in the duration of pregnancy and in the weight of the newborn. During the first year of the war, births registered numbered 37,085, of which 24,431 occurred in maternity hospitals. In the refuges for nursing mothers 4,000 children were cared for with their mothers, and only 15 died. The author believes that these results have justified a permanent public assistance for pregnant women and nursing mothers in Paris.—*American Journal of Obstetrics.*



# DIAGNOSIS OF PYLORIC STENOSIS AND PYLORIC SPASM BY THE DUODENAL CATHETER \*

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Boston

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During the past year the duodenal catheter has been used at the Infants' Hospital in the differential diagnosis of conditions affecting the pylorus, to some extent in their treatment, and also in treatment of other cases with vomiting. I wish to describe the technique of duodenal feeding and the foods suitable to feed in a later paper, when the therapeutic use of the tube has been more thoroughly worked out. I will give in this paper the method of examining the pylorus by catheter and the conclusions to be drawn from the examination.

The first catheter used was a 13F, about 100 cm. long, with a side opening near the end and a small end opening. The tube was fed rapidly to the infant until the stomach was quite full of tube, the manipulator trusting that peristalsis would carry the tube through the pylorus. Experience with this long tube taught that at the time the tube was passing the pylorus the baby gagged and if bile was obtained the introduction was considered successful. This tube was unsatisfactory in that there was too much of the element of chance in its passage and no idea could be given as to the size of the pylorus and consequently no definite exploration made. I felt that if the tube failed to pass it had probably pointed in the wrong direction. However, later work showed that the results were more accurate than was supposed at the time, and that failure to pass was due to an obstruction of the pylorus.

After going over the work done by Hess with the duodenal catheter and taking his measurement of the distance from the gums to the pylorus and the size of the pylorus, I felt sure that the catheters in use were longer than necessary, hence expensive, and were too small. Taking the distance of the pylorus from the gums as 26 cm., it seemed as if the ordinary urethral catheters of 42 cm. might be long enough and have several centimeters to spare. I have found such catheters in sizes from 13F to 22F satisfactory for all diagnostic work, but I am not yet sure that they are long enough for duodenal feedings.

\* From the Infants' Hospital, Boston, Mass.

The size of the catheter to use depends on the age and to some extent on the size of the baby. A 13F is small enough to begin with. I have passed a 14F into the pylorus of a small seven months' premature infant suffering from spasm of the pylorus when one month old. At two months a normal infant should take at least a 15F and at six months an 18F or larger. The tube should not be too soft, in order that any resistance offered during its passage may be appreciated.

The position of the infant while passing the catheter or during a stomach wash is a matter of choice. It makes no difference as to the safety or success of the operation whether the baby is upright, prone with face up, or on his side. I prefer to have the baby wrapped in a blanket to keep his arms down, lying on a table on his back, the head held face up by the nurse. The stomach should be empty or may be emptied through the catheter before attempting to enter the pylorus, and the catheter freed of curds.

The ordinary hasty method of introducing a stomach tube is fatal to good results and is an unnecessary hardship for the baby. Introduce the catheter slowly and steadily. In this fashion there is no unnecessary discomfort for the baby and more than all the reflexes may be observed as they occur. I wish to say emphatically that I consider the reflexes the most important guides to a successful passage of the duodenal catheter.

There are three reflexes to watch for while passing the catheter—pharyngeal, cardiac and pyloric. The baby gives a gagging reflex when the tube passes into the pharynx or the cardia and again as the tube enters the pylorus or, better, into the antrum near the pylorus. When the tube touches the posterior pharyngeal wall the baby gags. As the tube is pushed steadily onward the gagging ceases unless the tube is handled roughly, and the baby is more comfortable and may even aid by swallowing. At about 18 cm. from the gums the tube meets a resistance and the baby gags. This is the cardiac reflex. When the tube enters the stomach there is a rush of air or stomach contents, the baby is again more comfortable and will not gag unless the tube approaches the pylorus or comes back into the cardia. Now if the tube is pushed onward into the antrum of the pylorus or into the pylorus itself, the third gagging reflex occurs and is followed by relief of the gagging with the passage of the tube. The baby will remain fairly comfortable without gagging with the tube in the stomach and even during a stomach wash. I have found it diffi-

cult to stay out of the pylorus in a normal baby while doing stomach washing, and I have seen a demonstration of stomach washing before a class of students fail on account of gagging and vomiting because the nurse had introduced the tube too far and was washing out the infant's duodenum.

I have often been asked how I knew when the catheter had passed. It is by watching the reflexes as they occur, and the relief from gagging after passage and the feel of the catheter. If the tube is introduced carefully the reflexes occur and may be demonstrated in the normal infant. The reflex will continue as long as the tube presses against the part and will cease only when the tube passes the given part or is withdrawn. The same sensation is felt with the catheter going through the pylorus as when it is passed through a stricture of the urethra, an obstruction is met, there is a tendency on the part of the tube to buckle, and the tube goes into the narrower canal with increased sense of resistance.

There are several other ways to tell when the catheter has passed the pylorus. Usually if the tube is clear, as soon as it enters the duodenum there is a rush of gas or a spurting of the contents of the tube and sometimes of bile due to reversed peristalsis from irritation of the tube. This is characteristic and definite if it occurs. Suction on the tube while in the stomach brings gas or stomach contents unless the tube is blocked by curds. I find the ordinary 10 c.c. measuring pipettes convenient for aspiration through the catheter. If there is any doubt as to plugging of the tube a little water blown down will dislodge the obstruction and air may be drawn up. If in the duodenum it is more difficult to obtain air. If it is difficult to obtain air with a free tube, and if, on withdrawal of the tube, there is a rush of air it is certain that the tube was in the duodenum. If bile comes up during suction the tube is in the duodenum, or if there is bile in the tube after withdrawal it was in the duodenum. I have not paid much attention to the chemical reaction of the fluids aspirated, because there was always too much stomach contents left in the tube when going through to become mixed with duodenal contents, hence masking the reaction.

We have used the duodenal catheter at the Infants' Hospital in the diagnosis of cases with vomiting, which has persisted in spite of changes in food, to determine whether or not there was obstruction at the pylorus. It has no use in the cases of com-

plete congenital hypertrophic stenosis. That picture is too clear to need to determine the patency of the pylorus. Nor is it of especial value in cases of gastric indigestion with vomiting due to some error in diet relieved by proper diet and stomach washing. However, in the cases with vomiting, visible gastric peristalsis, no palpable or questionable tumor, stationary weight or loss, with small digested stools, the treatment must rest on the determination of obstruction at the pylorus. I believe the duodenal catheter offers the easiest means of making the diagnosis. In cases of indigestion with irritable pylorus, which we believe constitutes the class of cases called pylorospasm, a normal-sized catheter will go through with markedly increased reflexes. On the other hand, if there is any obstruction at the pylorus, due either to a partial congenital hypertrophy or to the hypertrophy of an otherwise normal circular muscle due to continued spasm, if that is possible, then the catheter will fail to pass or a smaller one than normal will pass with difficulty.

There have been admitted to the Infants' Hospital during the time the catheter has been in use about 20 cases of spasm of which the following is typical:

Girl, five months. Breast fed four weeks. Began to vomit at two weeks. Breast milk scanty. Gin in large doses. After four weeks breast at night, whole milk mixtures with added lactose in the day. Admitted for emaciation and vomiting.

Examination showed a thin, emaciated baby, gastric peristalsis visible over a small area, no tumor. Otherwise negative examination. A normal size catheter admitted immediately. X-ray showed immediate emptying. Proved to be a severe case of carbohydrate indigestion.

This case is typical of a group diagnosed as pyloric spasm, with the type of indigestion added to the diagnosis. This diagnosis is made on cases of vomiting showing visible peristalsis, which make slow gain or even standstill in weight, have small normal stools, no tumor, the pylorus admitting a normal size or slightly undersize catheter with increased reflexes. They prove to be cases of severe indigestion without much, if any, dilatation of the stomach and improve when the error in diet is remedied, but the convalescence may be long and stormy. There is no demonstrable obstruction at the pylorus and the cases which have been X-rayed show immediate emptying time or rather immediate passage of food from the stomach. This type of case must be differentiated from those with a definite obstruction at the pylorus.



The diagnosis of partial stenosis has been used at the Infants' Hospital to designate cases with vomiting, visible peristalsis, no palpable tumor or a questionable one, small digested stools, delay in the passage of food from the stomach as demonstrated by the X-ray, failure to pass a catheter or passage of one much smaller than normal and without increased reflexes. It seems to me that probably many cases of spasm which have done badly belong to this class. I mean the ones which drag along for months improving for a few days after each change in food and finally die from some acute disease. All of our cases of this class died, and it was to get some relief for these unfortunate cases that an accurate means of diagnosis was looked for with the duodenal catheter. Cases with this diagnosis are now recommended for operation. Two cases will serve to illustrate the group:

Boy, three months old. Vomiting began at three days and soon became projectile. Breast omitted and various foods tried without relief. Admitted with the diagnosis of pyloric spasm.

Examination showed an emaciated baby weighing 1 pound less than birth weight. Gastric peristalsis visible, questionable tumor. A 13F catheter passed with difficulty and without marked increase reflexes. X-ray showed no immediate passage of food. Some retention by stomach tube. With the daily passage of the catheter there was less vomiting and a fair gain in weight. At about seven months there was still vomiting, marked increase in the retention as shown by stomach tube and X-ray, and no larger catheter was admitted.

This was the first case in which operation was advised depending on catheter findings.

Posterior gastroenterostomy by Dr. Risley. Recovery from the operation, but the baby died in a week from bronchopneumonia. Postmortem not permitted, but there was definite thickening of the pylorus demonstrated at operation.

Boy, admitted to the hospital when four days old for vomiting. Vomited directly after each feeding. There was visible peristalsis, no tumor. 13F at first failed to pass, later passed with difficulty and brought up in the eye of the catheter a little bloody mucus. No relief to the vomiting by careful feeding, including breast milk. X-ray showed no immediate emptying and delayed emptying. 13F always passed with difficulty and without increased reflexes.

Operation by Dr. Vincent when baby was one month old. Stomach dilated and pylorus thickened. Gastroenterostomy performed. Good recovery from operation. Convalescence stormy, with vomiting of bile, but no food. Five weeks later taking food well, digesting and gaining.

The 2 cases just described seem to me to belong to the type of partial congenital hypertrophic stenosis. I think there is another type of partial stenosis seen in older babies resulting from long untreated, or improperly treated spasm when the circular muscle becomes hypertrophied from overactivity. This occurs in older babies with a history of vomiting and a history pointing to indigestion of one of the food elements. There is visible peristalsis, a thickening of the pylorus, which feels more like a band than the usual tumor of congenital stenosis, the stomach is dilated and never completely empties, the catheter is passed with difficulty and without the increased reflexes of an uncomplicated spasm. The following case is suggestive of such a possibility:

Boy, nine and a half months. Birth weight not known. Irregularly breast fed for six months, then Mellin's Food and condensed milk. Vomiting increased on the artificial foods, but has always vomited and lately collectively. Present weight ten pounds.

Examination showed marked peristalsis over a large area; no tumor, but indefinite thickening of the pylorus. Retention 60 c.c. to 90 c.c. three hours after feeding in spite of vomiting. A 14F catheter passed with difficulty without increased reflexes. The X-ray showed no immediate passage and marked residue after six hours. Feeding experiments showed carbohydrate and fat indigestion.

Operation was advised on the grounds that with the obvious obstruction at the pylorus and with the dilated stomach no relief could be expected for the indigestion without freer passage of food into the intestine.

Posterior gastroenterostomy was performed by Dr. Vincent. The stomach was much dilated and there was a thickening of the pylorus. Convalescence at first stormy. Five weeks later digestion good, gaining, weight over 12 pounds. This was a better result than the average feeding case in the same ward.

This case shows, I think, that there can result from continued spasm of the pylorus a condition of the circular muscle

which will give an obstruction and which can only be relieved by operation.

It seems to me that the duodenal catheter offers the easiest and the most reliable means of detecting a pyloric obstruction in doubtful cases in infancy. The treatment must rest on the diagnosis of obstruction. If a normal size catheter passes it is safe to wait regardless of the other symptoms and try to regulate the diet. I do not agree with the statement that I have read, that a pylorus admitting a catheter does not need to be operated on. I know that a baby in a much emaciated condition, with a partial congenital hypertrophic stenosis and with a palpable tumor, may admit a large catheter without reflex, but after feeding with a catheter and general improvement the tumor shut down and a 13F failed to pass.

Increased reflexes with the passage of a normal size catheter means spasm and should be treated by stomach washing and regulation of the diet.

Obstruction to the passage of a normal size catheter, or the passage of a catheter smaller than normal with normal or diminished reflexes, means partial stenosis and should be relieved by operation, the choice of the operation to be left to the surgeon.

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ACIDOSIS OCCURRING WITH DIARRHEA—According to J. Howland and W. McK. Marriott (*American Journal Diseases of Children*, 1916, Vol. XI., p. 309) acidosis is found in many cases of severe diarrhea not of the ileocolitis type. The clinical expression of the acidosis is hyperpnea. The presence of the acidosis has been confirmed by determining a lowering of the carbon dioxide tension of the alveolar air, by an increase in the hydrogen ion concentration of the blood serum, by a diminution of the alkali reserve of the serum, by an increase in the amount of alkali required to alter the reaction of the urine (alkali tolerance) and by a diminution of the combining power of the hemoglobin with oxygen. It has been shown that the administration of sodium bicarbonate will often bring about a cessation of the hyperpnea and cause the laboratory tests to give the results that are found with normal infants. The acidosis is not due to the presence of acetone bodies. It has not been demonstrated that it is due to loss of base. It is probable that it is due to deficient excretion of acid phosphate by the kidneys.—*American Journal of Obstetrics*.

## THE ESTABLISHMENT OF A DEPARTMENT OF PREVENTIVE MEDICINE IN A HOSPITAL TREATING CHILDREN \*

BY CHARLES V. DORWARTH, M.D.

Physician to the Health Clinic, The Children's Hospital of Philadelphia

A hospital treating infants and children is not fulfilling its obligations if it only takes care of them when ill. It has a much broader duty to perform. We conceive it to be the function of a hospital to act as a center where measures to safeguard the health of children are originated and put into effect.

A Department of Preventive Medicine should be created and established as a distinct unit of the hospital, just as that of the ward, the dispensary, and pathological departments are distinct units. This department should have, as its head, a physician who will direct the work; as many assistants as the magnitude of the work undertaken requires; internes to be assigned to this department in rotation as in other services; pupil nurses to be detailed to the Department of Preventive Medicine in order that they may receive instruction in medico-sociological work.

Some of the important functions of such a department would be the establishment of:

(1) *Health Clinic*—A health clinic is a consultation where mothers may bring well children for examination and receive advice which will enable them to keep them well. Children discharged as cured from the wards and dispensaries will be referred to the health clinic. (In explaining the word "cured" it might be well to state that we do not give it too literal interpretation as many of the children are subnormal in nutrition and with lowered resistance.)

It should be the duty of the social worker to see that the patient returns to the health clinic at the time designated by the examining physician. This is an important point, as much of the success of the health clinic depends upon having the patient, when discharged from the ward or dispensary, come as early as possible.

It has often been our experience that cases which were discharged well, delayed too long in coming to the health clinic, and were found on their visit to be again ill and had to be either readmitted to the ward or referred to the dispensaries.

\* Read before the Philadelphia Pediatric Society, June 13, 1916.



Mothers should be encouraged to bring all their children to the clinic for examination and advice.

In the health clinic the problem of each individual infant or child is studied and suggestions are given whereby the general physical condition may be brought to the highest degree of efficiency.

The function of the health clinic should be broad enough to cover the administration of remedies for the prevention of disease, such as vaccination against smallpox, pertussis vaccine for the prevention of whooping-cough, prophylactic typhoid immunization, and even the administration of diphtheria antitoxin if an epidemic of diphtheria exists in the neighborhood of the hospital. Schick and luetin tests should be performed and food antigens for the detection of food anaphylaxis given.

The cases which would be seen in the health clinic probably receive little attention in the regular children's dispensary, because the physicians there are usually so busy with sick children that they hastily dismiss those who seem to be well.

(2) *Prenatal Clinic*—Another important function of the department would be the establishment of a prenatal clinic and a maternity out-patient service, in charge of an obstetrician.

In the prenatal clinic, pregnant women receive instructions in personal hygiene. On the first visit to the clinic a careful history should be taken and a complete physical examination made and abnormal conditions noted. The patient should report at regular intervals, when the blood pressure will be taken and a specimen of urine examined.

If any abnormal symptoms manifest themselves the woman should receive early advice and be referred to the proper dispensary for treatment.

Patients attending the prenatal clinic may be delivered at their homes by the intern to the department of Preventive Medicine. During the delivery he will be assisted by a nurse assigned to this department, and their work should be supervised by the obstetrician in charge.

A most important postnatal function of the clinic will be a complete examination made within two or three weeks after confinement, the object being to discover and have remedied any injury which resulted from the child-bearing act.

(3) *Social Service Work*—The present social service departments of the hospitals will be an integral part of the Depart-

ment of Preventive Medicine. If it seems desirable to retain the name of "social service" it might be called the Social Service Division of the Department of Preventive Medicine. In our opinion, the chief function of a social service department is, in the broadest sense, the keeping of patients who have been treated in the hospital in good health and preventing a recurrence of their illness.

The personnel of the Department of Preventive Medicine may be augmented in many ways, for instance, by the addition to its staff, of teachers, lecturers, volunteer workers, clerks, clinical assistants and dietitians.

The follow-up nurse will visit the homes of the patients attending the health clinic and explain the physician's orders to the mother and give such demonstrations as necessary. The nurse will also be of assistance in the prenatal clinic in demonstrating to the patient the kind of clothes best suited to her condition, and how to prepare the articles necessary for confinement.

The data obtained by the nurse on her visit to the home will be of assistance to the physicians while the patient is being treated in the hospital ward. If the causal factor of the illness is an unsanitary condition of the house or the presence of a carrier of disease the necessary steps to correct the same will be taken.

Provision for convalescent care and summer outings will be duties of this division.

(4) *A Division of Physical Development*—A division of physical development should be established and placed in charge of a competent teacher of physical education. A gymnasium may be conducted for subnormal children, so that they will acquire a firmer muscular development.

The outline given above covers some of the most important functions of the Department of Preventive Medicine.

As an adjunct to the Bureau of Health, the Department of Preventive Medicine would play an important rôle in the control of contagious diseases in the vicinity of the hospital.

When a case, regarded as suspiciously contagious, is encountered an effort should be made to obtain data, and the case referred to the Bureau of Health, so that it may be investigated by them. In infectious diseases an effort should be made to find the focus of infection.

One of the most important functions of the Department of Preventive Medicine I have scarcely touched upon, namely, research work. Investigations into the prevention of diseases would naturally become a function of the department.

The Department of Preventive Medicine is an ideal place for the teaching of medical students.

In the health clinic, they would be taught to make correct physical examinations and thus observe physical signs in normal infants and children. They could instruct the mothers in preventive measures, with the idea of having them understand more clearly the effect of unsanitary conditions, poor housing, etc., upon infant life, it would be well for them to spend some hours doing field work. In the division of physical development they would receive practical demonstrations of the various methods of conducting physical education.

A few other functions of a Department of Preventive Medicine should be:

(1) Neighborhood educational work.

(a) Lectures on infant hygiene for parents.

In delivering a series of lectures before parents, it is desirable to choose a time when it is possible for them to come without their children, as crying infants and children always detract the attention of the mother and possibly the surrounding persons, and therefore it is questionable how much of the instruction they are able to acquire.

Lectures on contagious diseases and quarantine may be included in this series.

(b) Prenatal class: Lectures on personal hygiene may be delivered by the department staff to expectant mothers.

(c) A class of little girls could be established at which care and hygiene of infants would be taught and demonstrated. Many classes of this kind are now conducted as elective courses in the public schools and are quite popular. The knowledge gained by these girls is utilized to the advantage of their baby brothers and sisters.

(d) A club of boys at which lectures on sanitation would be delivered. The members may be taken on "hikes" to streets where unsanitary conditions are known to exist and bad housing pointed out to them. If

they at any time encounter similar conditions they should report them to their president or leader, who, in turn, reports them to the Division of House and Sanitation of the Bureau of Health. Such a club could do much toward improving the sanitary conditions of the neighborhood.

(2) An effort should be made to locate women available for wet-nursing, residing in the vicinity of the hospital and to find employment for them, either at the hospital or in their own homes by nursing hospital infants.

(3) Have the field workers constantly on the lookout for unlicensed baby farms, and if any are found report them promptly to the Division of Child Hygiene.

(4) Efforts should be made to change the environment of children living in immoral surroundings or with parents who are mentally deficient.

(5) This department should work in close coöperation with day nurseries of the district.

(6) Secure the coöperation of the city physicians assigned to the district and the physicians in the vicinity of the hospital.

In order to make such work as I have outlined most effective, it must be concentrated to the district in the immediate vicinity of the hospital. The size of the district will depend upon the number of workers which the management is willing to supply the department.

Suggestions as above outlined are by no means new to the hospitals of Philadelphia. Many hospitals interested in prophylactic work perform more or less of all the functions herein outlined, but we would suggest that because of the great importance of the work and the fact that it could be done with greater efficiency, that it be correlated in the form of a distinct department of the hospital under the head of a physician qualified to direct the work in preventive medicine.

I am indebted to Dr. Howard Childs Carpenter, Director of the Department of Preventive Medicine, The Children's Hospital of Philadelphia, for many valuable suggestions given in the preparation of this paper.

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BACTERIAL AFFECTIONS OF THE KIDNEYS IN CHILDREN.—H. L. Kowitz (Jahrb. f. Kinderhk., October, 1915) says that pyelocystitis is frequent in infants, but is seldom recognized, the fever being referred to other conditions, so that the condition goes on and becomes chronic. Formerly it was supposed to ascend from the bladder, but at the present day it is supposed to come by way of the blood-vessels. In the largest number of cases the cause is the bacillus coli communis. In the clinic at Magdeburg the author observed 40 cases in children under two years of age. In all febrile diseases, especially in gastrointestinal diseases, chemical, bacteriological and microscopical examination of the urine should be made. In all the author's cases intestinal disturbances accompanied the pyelocystitis. The kidney trouble appeared from three to nine weeks after the beginning of the intestinal condition. The largest number occurred in July and August, in hot weather, the smallest number in the winter, when gastrointestinal diseases are least frequent. If the disease ascended from the bladder it should begin with a cystitis, which is not the case. The urine was obtained by the author under aseptic precautions, centrifuged and cultivated in agar and gelatin. Out of the 40 cases there were 37 of pure colon bacillus and 3 of mixed infections with staphylococci and streptococci. In these 3 mixed cases a furunculosis was present. The germs were also found in the blood stream. The anatomopathological examination showed that the infection was hematogenous. There were small abscesses in the kidneys and hemorrhagic zones, leukocytes and lymphocytes were found in the tissues. The canaliculi were dilated, there was increase in the connective tissue, fat in the canals and glomeruli and scars of old abscesses. In the pelvis were increase of connective tissue and cell infiltration, and changes in the epithelium. In the bladder were hyperemia and thickening of the mucosa. It would seem that pyelitis is a phase of a general disease, not primarily a local phenomenon. The blood picture shows leukocytosis and eosinophilia. In the urine albumin is found with a bacteriuria added. Pus cells, epithelia and casts are found, with red blood cells. The author concludes that we have an infection of hematogenous origin, which we should call a bacterial nephritis, or a colinephritis rather than a cystitis.—*The American Journal of Obstetrics.*

## HENRY LEBER COIT

Doctor Henry Leber Coit, the originator of the Certified Milk scheme and movement, and prominent in pediatrics both in this country and abroad, died at his home in Newark, New Jersey, suddenly of pneumonia, on March 12, 1917, after only forty-eight hours' illness.

Doctor Coit was distinctive for his careful work and capacity for organizing and directing organizations. His scheme for the certification of milk he worked out alone and then developed its application in a neighboring dairy plant. So careful and intelligent was his preliminary work that no material modification was ever made after its application nor has any real improvement been advocated or carried out since then by any one else. By the use of these same faculties Dr. Coit organized a babies' hospital in Newark which he soon had on a satisfactory financial and medical basis.

Dr. Coit was personally an attractive man, straightforward, direct though careful in every step, a reliable friend, a tireless worker. He died in the midst of his work, after many honors had been bestowed on him. He was a member and Vice-President of the American Pediatric Society; a Fellow of the New York Academy of Medicine; a member of the New Jersey Academy of Medicine. He was twice President of the New Jersey State Pediatric Society; twice President of the American Association of Medical Milk Commissions; member and Vice-President of the American Association for the Study and Prevention of Infant Mortality; and Vice-President of the English-Speaking Congress of Infant Mortality held in London in 1913. He was President of the Practitioners' Club.

Dr. Coit was born in Peapack, New Jersey, March 16, 1854, a son of a clergyman, the Reverend John Summerfield Coit. He was educated in the Newark public schools and in the New York School of Pharmacy, where he was graduated in 1876 as valedictorian. He followed the profession of chemistry for four years and then entered the College of Physicians and Surgeons in New York, where he was graduated in 1883 and immediately afterwards settled in Newark, where he practised medicine.

In 1886 he married Miss Emma Gwinnell of Newark. He is survived by his widow, three daughters and a son.

ROWLAND G. FREEMAN.



HENRY LEBER COIT

## SOCIETY REPORTS

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### THE PHILADELPHIA PEDIATRIC SOCIETY

*Stated Meeting, Held October 10, 1916*

THE PRESIDENT, JOHN F. SINCLAIR, M.D., IN THE CHAIR

DR. ESTHER M. WEYL showed an unusual case of typhoid fever. The child was a six-year-old boy, who was admitted to the Woman's Hospital with a history of vomiting, frequent yellow stools, and epigastric pain of three days' duration. The family, social, and past history had no bearing on the case. On examination the child was found to be well developed, although rather pale; there was a diminished resonance over the entire left chest, a soft systolic murmur transmitted equally over the precordium, but the liver and spleen were not palpable. The first two urine examinations showed a few casts. After that the urine was negative. The eye grounds were negative. On the second day after admission, rose-colored spots appeared on the abdomen. A blood culture and a Widal reaction were negative. During the first week the temperature ranged between  $102^{\circ}$  and  $104^{\circ}$  F.; respirations were 32, and the pulse 120. The white blood count at this time was 8,820.

During the second week, the temperature was normal in the morning with an evening rise to  $102^{\circ}$  F., pulse 112 and respirations 22. The second Widal at this time was also negative. A von Pirquet reaction was positive. The physical examination continued negative with the exception of a few dry rales in the upper left chest.

During the third week a relapse occurred, and blood taken at this time showed typhoid bacilli. The spleen now became palpable. The laboratory and clinical findings during the first week raised the question as to whether the typhoid began at this time, or whether the disease really began at the apparent relapse on the third week.

DR. ARTHUR NEWLIN and DR. JAMES MCKEE cited similar cases to the above which had occurred in their experiences.



DR. FRANK CROZIER KNOWLES with DR. NEWELL CHRISTENSEN showed an interesting case of hypertrichosis in an Italian boy of four years of age. There are several other children in this same family who were entirely normal, and, as far as could be ascertained, no other of the child's relations had been affected with this excessive growth of hair. The hair was present over the face, forehead, back, legs, under the arms, and in fact on almost every area of the child's body, with the exception of the nose and immediately around the eyes. In some places, such as on the back, the hair was 1 to 2 inches in length. The mentality did not seem to be impaired in this child. Dr. Knowles said that these cases are likely to be hereditary, and often some ductless gland is at fault.

Dr. Knowles also showed another case of congenital lues, which had typical signs, such as fissures around the mouth and anal region, and marked peeling of the skin on the palms and soles. Dr. Knowles spoke of the fact that these children can stand large doses of mercury.

DR. NATHANIEL GINSBURG demonstrated a patient in whom bone transplantation and arthroplasty of the elbow joint had been performed. This child had had myelitis of the humerus following an attack of measles in May, 1915. Bone was transplanted from the leg. There had been two operations. At the present time the child had good elbow motion, but the bone growth had been too active and there was more bone produced than was necessary. This case demonstrated the possibilities of bone transplantation. Dr. Ginsburg said he intended to do another operation on this child. X-ray pictures were demonstrated.

DR. E. W. RODENHEISER showed a case of Von Jaksch's anemia.

DR. PERCIVAL NICHOLSON showed a case of enlarged thymus which had been treated with X-ray. This patient was an entirely bottle-fed baby of seven months, who for several months had had a very tight cough which was unrelieved until X-ray treatment of the thymus was instituted. After each X-ray treatment there was improvement. At the present time the child was very much better and had a very slight cough.

DR. DAVID R. BOWEN, who had treated this case with X-ray, remarked that one should be very cautious about diagnosing

enlarged thymus from an X-ray plate, inasmuch as many children showed a shadow in the region of the thymus, but had no symptoms of thymus disease.

DR. ARTHUR NEWLIN, who had at one time treated this case, said that he felt that the clearing up of the symptoms after X-ray confirmed the diagnosis of thymus disease.

DR. J. C. GITTINGS, DR. JAMES MCKEE and DR. HARRY LOWENBURG also discussed thymus disease.

DR. J. R. WELLS showed a case of hygroma of the neck. This baby was born with normal delivery. It was very difficult to get any past history on this case. The tumor at the present time was on the left side of the face. In the three weeks in which Dr. Wells had observed the tumor, it had been growing rather rapidly. There was fluctuation, and pressure would send the fluid from one part to another, while the tumor continued as a hard mass in the centre. At the present time there was considerable obstruction to breathing and swallowing.

DR. NATHANIEL GINSBURG asked whether this case might not be a lymphangioma. He believed in any case that the patient should be operated on, as in these conditions the use of boiling water was dangerous. The pathological condition, whatever it was, would sooner or later kill the child.

DR. GEORGE COATES demonstrated some cases of ozena, showing the results of vaccine treatment. After reviewing the literature on this subject, and discussing the other methods of treatment, Dr. Coates said he felt that while the vaccine treatment did not cure, it offered the best means of combating this disease. The vaccine was made from an organism isolated from beneath the scales on the mucous membranes.

DR. THOMAS KELLY demonstrated a patient with meningitis closely simulating the tuberculous form. This patient had had all the physical findings and laboratory findings of tuberculous meningitis, with the exception of finding tubercle bacilli in the spinal fluid. The child had recovered and at that time was perfectly well.

## THE PHILADELPHIA PEDIATRIC SOCIETY

*Stated Meeting, Held November 14, 1916*

THE PRESIDENT, JOHN F. SINCLAIR, M.D., IN THE CHAIR

DR. THOMAS B. HOLLOWAY showed the following cases: (1) Anophthalmus. (2) Aniridia, with dislocation upward of both lenses, and secondary glaucoma. (3) Microphthalmus. (4) Buphthalmus. (5) Cranial deformity, associated with optic atrophy.

DR. WILLIAM DRAYTON, JR., read a paper on "The Treatment of Poliomyelitis from the Standpoint of the Neurologist."

Dr. Drayton said that, for his part, he did not believe the disease to be more than mildly contagious, if contagious at all.

In the treatment of the disease during the acute stage he had tried most of the recommended forms of therapeutics, including normal serum and so-called immune serum (serum from a patient who had recovered from the disease); the adrenalin solution in spinal injections; and most of the other therapeutic measures. After seeing many of the cases injected with serum and adrenalin, Dr. Drayton believes that lumbar puncture for relief of pressure gives as good, if not better, results than any injection thus far tried. He has seen cases with practically total paralysis of all extremities, chest, back and neck make good recoveries with no other treatment than simple lumbar puncture. The percentage recovery from each form of treatment has not as yet been worked out, but there will probably be little difference, if any, in the results.

In his work it was impossible to make fourth-hour spinal injections of adrenalin solution on account of the large number of patients and the small working force. It is possible that better results would have been attained if this had been done. Dr. Drayton noticed that the irritability and fretfulness of the patients were much better on cool days. Frequent sponge baths with tepid and cool water, changes of posture, and good nursing are most essential. The diet should be light, but nutritious, and great attention should be paid to the gastrointestinal tract, as diarrhea with mucus is a frequent occurrence.

A few cases had paralysis of deglutition, and these were fed with a stomach tube until they were able to swallow. A few had

to be catheterized for some days, as they were unable to pass urine voluntarily.

For respiratory paralysis they found no successful treatment, as it is due to a central lesion. The ordinary respiratory stimulants are valueless, and from this cause most of the deaths occurred.

Frequency of lumbar puncture depends largely on symptoms. Increasing paralysis, great restlessness, irritability, pain and meningeal symptoms are almost always benefited by puncture. Puncture may be performed two to four times in twenty-four hours without ill effect, and may be continued for days. Recurrence of meningeal irritation, drowsiness and irritability are often relieved even late in the disease by this procedure.

After the most acute symptoms have subsided, the treatment varies with each particular patient. Cases showing mere weakness without definite paralysis frequently recover spontaneously in a few weeks' time, simple rest in bed being all that is required. More severe cases require a variety of treatments, depending upon the pain, parts affected and the extent of the paralysis. Always remember that any muscle or group of muscles may be paralyzed, and make frequent and careful examinations to discover the exact amount and location.

In the early stage of the disease no active treatment should be attempted. Rest is all that is required.

Prevention of deformity is, however, most important, and in treating paralyzed legs light splints of cardboard, leather, wood or metal well padded, or very light removable plaster casts, should be used.

Pain persists in many cases for a few weeks to two or even three months. Perhaps the commonest seats are beneath the knees, in the calves of the legs, in the feet, thighs, back and neck. The pain is not, as a rule, severe, and frequently is only elicited by moving the feet or legs.

A good working rule is absolutely no treatment but rest and the lightest friction until a week or two after the pain disappears, and then massage, electricity and exercises may be begun.

Massage should be given by an expert and never by an untrained person. At first a very light daily or second day treatment, slow effleurage and gentle pétrissage, to the arm six to eight minutes, to the leg eight to ten minutes.

Always avoid tiring the patient. Many parents and some



physicians try to hurry recovery by letting the child sit up or walk too soon, and by pushing massage and exercises.

When the patient first endeavors to sit up or stand, unsuspected weakness of the abdomen or back is often discovered. Before these cases are allowed to sit up or walk for any length of time a suitable corset should be applied, as by this means deformity may be prevented. The length of time a child should sit up or be on his feet—for many of the lightly paralyzed cases can walk—must be decided on with great care.

Gradual increase in the force and duration of massage should be made, and electricity may be applied when massage is first given. Dr. Boyer, of the Orthopedic Hospital, said: "We use exclusively the positive pole of the galvanic current in our treatment of the affected muscles, as this is the only current known that will make these muscles contract."

They began treatments in mild cases after six weeks, and severer cases only after two or three months. Treatments should be given daily, and for a period of not more than say six minutes to an arm, and eight to ten minutes to a leg.

After massage and electricity have been given for some time, they begin with remedial gymnastics and muscle training.

Prognosis will frequently be asked for by the parents, and it is never well to venture an absolute opinion as to curability or incurability, for some cases improve remarkably after years of treatment.

To summarize, order sufficient rest and inactivity in the early stages; gradual increase of massage, electricity, exercise, and muscle training later, with frequent consultations with the orthopedist for the prevention of deformities; encouragement to the patient and parents; and persistence in treatment, even though there is little if any improvement seen.

DR. BRUCE GILL then read a paper on "The Treatment of Infantile Paralysis during the Period of Recovery."

There are three stages in the course of infantile paralysis. The acute stage lasts until all pain and tenderness have disappeared. It occupies from a few days to a number of months. The stage of recovery occupies about a year following the acute stage. Proper treatment is very essential to as rapid and complete recovery as is possible. The final stage is that of permanent paralysis during which no further recovery of power in the muscles may be expected. However, the orthopedic surgeon may

accomplish a very great deal by operative procedure to secure muscle balance and stability of the affected members.

The pathological condition in the spinal cord at the conclusion of the acute inflammation varies in different cases and cannot be certainly diagnosed in each. Many or few of the motor cells may be dead. In the latter case there will be almost complete recovery if the paralyzed muscles are kept in good condition to respond to the return of nerve power when it occurs.

The rapidity and amount of recovery in the paralyzed members depends not only upon the recovery of the nerve centers, but upon the maintenance of muscular tone and the prevention of over-stretching or contracture of muscles and ligaments and the deformity of bones and joints.

Normal function of any organ or structure is nature's greatest cause of normal growth. The alternation of periods of activity and rest is her only method of development. The same principle holds true during the recovery from infantile paralysis, only the periods of rest should be relatively longer than in normal children because the paralyzed members are weakened. Too great or too long a period of activity will exhaust them. Therefore, to secure proper rest and proper stimulation to activity, and to prevent deformity, are the two objects of treatment during the stage of recovery.

The amount of rest which the child should have varies in different cases. Where there is a great weakness, extensive paralysis, or emaciation, the period of absolute rest should continue a long time after the inflammatory symptoms have disappeared. In less severe cases it need be continued no longer than for two or three weeks.

Then stimulation should be begun, slowly, carefully, gently. Hot baths and gentle upward stroking movements to be followed later as tone of muscles is recovered by alternating hot and cold baths or douches and by gentle muscle kneading.

The electric current is not used to secure contraction in the weakened or paralyzed muscles. The interrupted galvanic current is the best, with the positive pole over the muscles and the negative over the spine. Only a few contractions should be produced at first, and with as weak a current as is possible to secure the result.

Every effort should then be made to have the child make active motions, *i.e.*, to secure a return to normal function. But

the strong antagonists of weakened muscles must not be overdeveloped. He should be allowed to walk and play and lead a normal life as soon as he can do so without production of deformity. If weight bearing is postponed too long the extremity will fail to develop, the bones will not lengthen, and great shortening will result.

However, in paralysis of the muscles of the back the patient must be kept a long time flat in bed to prevent a paralytic scoliosis. And when the upright posture is assumed the back must be supported by a removable jacket or brace.

When the arms are paralyzed the child must be kept in bed longer than usual, and when he gets up the arms should be carried in a sling to prevent dropping of the humerus at the shoulder.

Deformity must be guarded against from the very beginning of the treatment. The extremities must be maintained so that weakened muscles are not over-stretched, strong muscles contracted, capsules and ligaments of joints stretched or contracted. The foot must be kept in a position at a right angle to the leg, the knee and hip must be extended, and internal or external rotation of the thigh must be prevented. A short, right-angled splint with a transverse piece of wood on the bottom should be bandaged to the foot. This device will keep the entire extremity in a proper position.

When the child is allowed to walk, proper shoes and braces should be applied to prevent any tendency to deformity, and to allow weight bearing before it would otherwise be possible.

This paper emphasized the vast importance of proper treatment during the stage of recovery from infantile paralysis. If this is secured, there will be much less necessity for orthopedic operations in the final stage of permanent paralysis.

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DIPHTHERIA IN THE FIRST YEAR OF LIFE—J. D. Rolleston (American Journal Diseases of Children, 1916, Vol. XII., p. 47) says that diphtheria in the first year of life is comparatively rare. Only 20 patients at this age occurred among a total of 2,600 diphtheria patients of all ages. Congenital syphilis is an important predisposing cause. Sixty-five per cent. showed some nasal involvement, with or without other diphtheritic lesions elsewhere, as compared with 25.6 per cent.; 30 per cent. were purely nasal, as compared with 1.5 per cent.—*American Journal of Obstetrics.*

## THE NEW YORK ACADEMY OF MEDICINE—SECTION ON PEDIATRICS

*Stated Meeting, Held January 11, 1917*

THE SECRETARY, OSCAR M. SCHLOSS, M.D., IN THE CHAIR

### SUBACUTE AND LATENT INFANTILE SCURVY. THE CARDIO- RESPIRATORY SYNDROME. (A NEW SIGN)

DR. ALFRED F. HESS said that in previous papers it had been established that infantile scurvy might be brought about by a diet of pasteurized milk. They had found that when the use of orange juice was discontinued in the dietary of a group of infants who were being fed on milk which had been subjected to a temperature of 140°F. for thirty minutes, some of them in the course of from two to four months showed signs of scurvy. That these signs were in reality scorbutic and, furthermore, that they were attributable to pasteurized milk, was proved by their rapid disappearance when orange juice was again added to the dietary, or when the raw milk was substituted for the heated milk. The practical deduction from these observations was not, however, that pasteurization should be discouraged, nor that milk treated in this way was objectional, but merely that the important fact should be recognized that it was not a complete food for infants and that it was imperative to give an anti-scorbutic in addition. Where the prophylactic measure was observed, fresh pasteurized milk became a most valuable food for infants, and was to be highly recommended because of the security which it afforded. Their observations had led them to believe that scurvy brought about by pasteurized milk was not at all infrequent, that pasteurized milk was indeed the most common cause of scurvy, and that it induced a type of disorder which generally passed unrecognized. The stereotyped picture of infantile scurvy was that of a poorly nourished infant, lying with one or both thighs flexed on the abdomen and who, on closer observation, was found to have bleeding, spongy gums and enlargement of the lower end of the femur associated with exquisite tenderness. This was the syndrome that the medical student carried away to guide him in his every-day practice.



This was the florid type, met with only occasionally and requiring merely a routine physical examination for recognition. The commoner form, which might be termed "subacute infantile scurvy," was composed of a large number of symptoms which were inconclusive individually and might well escape a correct interpretation. The affected baby was usually in the second half of the first year of life, and did not gain, or gained but slightly, for weeks. It might be fairly well nourished, and was pale, with perhaps slight edema of the eyelids. The mother or nurse complained that the child was peevish or irritable, and the appetite had diminished. The gums might show merely a lividity or slight periodontal hemorrhage, which on subsequent examination was no longer visible, and it might have consisted only of a ridge of crimson edging the border of the upper gum, or had been situated behind the upper incisor. The papillæ of the tongue might be markedly congested, and a petechial spot might be seen on its frenum, on the palpebral conjunctiva, or here and there on the surface of the body, more especially where there were erosional eczema or other skin lesions. Attention might be called to tenderness of the lower thighs, which in some instances was definite and in others so ill-defined that it was impossible to feel convinced of its significance. There might be a slight edema over the crests of the tibia, or the kind that did not pit on pressure. The knee-jerks were almost always markedly exaggerated. The urine was found to be normal or to contain some albumin and red and white blood cells. These symptoms did not constitute a rigid entity, but were subject to manifest variations. There were other symptoms worthy of note, especially those which had been disclosed by the aid of the X-ray. The heart might be involved in infantile scurvy. There might be an enlargement, especially to the right, accompanied by dullness and diminished breathing posteriorly at the base of the lungs. This type of enlargement was often well shown in the roentgenograms, as well as a marked broadening at the base of the heart, at the site of the large vessels. So far as he knew, attention had never been called to this latter phenomenon. Roentgenograms of the bones might show the "white line" at the epiphyse, first described by Fraenkel, or a thickening of the periosteum. Too great reliance should not be placed on these signs in making an early diagnosis of this disorder, as neither was invariably present. A pulse of over 150 and respirations of 60 per minute

had been found to occur frequently as early signs of this disorder. In one instance of subacute scurvy the pulse could not be counted, and the heart beat was found to be 200 to the minute. This was not a severe case; the patient did not appear to be ill, and merely showed some tenderness of the thighs, and red cells in the urine. When given orange juice there was a remarkable response in gain in weight and a disappearance of the other symptoms. The rapidity of the respiration was probably a more delicate indicator of this disturbance than the pulse, and had been found to be markedly affected when the latter was slightly increased in rate. The charts presented showed very graphically the sharp drop in the pulse and respiration when orange juice was given. This response proved that it was dependent on and the result of the scorbutic condition. Further, the charts showed that all anti-scorbutics were not exactly alike in their chemical nature or therapeutic action; that secondary beneficial results might follow the administration of vegetables in cases of scurvy in which orange juice had been taken for some weeks; that the temperature was affected as well as the pulse and respiration by anti-scorbutic treatment.

The type of tachycardia was that in which the pulse was regular and moderately strong, and its rapidity was heightened by the incidence of minor intercurrent infections. The increase in respirations was a polnea rather than a dyspnea. The baby was apparently in comfort while the respirations were 60 per minute. In the comprehensive report of the American Pediatric Society there was no reference to involvement of the heart and lungs in scurvy. This cardiorespiratory syndrome was without doubt occasioned by a disturbance of the nervous mechanism controlling the dual system. In view of the fact that the action of the lungs as well as that of the heart was affected, there could be no question of the symptoms being attributable to a primary muscular alteration. They could not be ascribed to anemia. The fact that these symptoms yielded precipitously within forty-eight hours to antiscorbutic diet did away with all questions of their dependence upon malnutrition or anemia. The phenomenon was clearly neurotic in nature and probably due to an involvement of the pneumogastric nerves. They had, therefore, one more link of evidence that the nervous system was involved in infantile scurvy, and that this disorder should no longer be regarded as affecting only the bones and blood vessels. The significance of

showing that infantile scurvy possessed an aspect which required it to be regarded as a disease of the nervous system was not only interesting in itself, but gained far greater importance when they considered that this association brought into closer relationship with beriberi, adult scurvy, pellagra, and the ever-increasing number of disorders which were classed as deficiency diseases, or, according to Funk, "avitaminosen." In beriberi they found enlargement of the heart, tachycardia, polynea, and generally increased knee-jerks; in adults in scurvy they found dyspnea, palpitation and hyperesthesia. In pellagra the pulse was frequently found rapid and even clinical changes had been found in the central nervous system. Skin lesions were also one of the characteristic signs of pellagra; it was, therefore, worthy of comment that in infantile scurvy, redness of the skin was not infrequently associated with edema over the tibia. It was also of interest that there was an eczema which developed in infants in the course of scurvy which yielded promptly to antiscorbutic treatment.

It was evident that previous to the onset of scurvy there must be a period during which the equilibrium of the essential substance or vitamine was no longer being maintained, but, on the contrary, a negative balance was in progress. This nutritional state might constitute a phase introductory to the occurrence of subacute or of florid scurvy. It might advance no farther and might be so slight that the body would be maintained in the latent scorbutic condition for months until, quite unintentionally, it was brought into equilibrium by the addition of some antiscorbutic stuff to the dietary. The diagnosis of latent scurvy was based mainly upon the reaction of specific therapy, the marked improvement when orange juice, potato, or other antiscorbutic food was taken. The symptoms, in themselves, were suggestive, but did not permit of a definite diagnosis. This condition of latent scurvy was probably the commonest type of the disorder and was frequently passed over unrecognized, especially in the larger cities, where almost the entire milk supply was pasteurized. Most infants happily were given orange juice before they were six months of age, and they received a small amount of vegetable or potato before they were much older. There was no contraindication to the giving of a teaspoonful of orange juice at one month to bottle-fed babies and of gradually increasing this amount to a tablespoonful at the age of three months.



DR. L. E. LA FÉTRA said he had been, very much interested, both this evening and on previous occasions, in hearing Dr. Hess describe this mild form of scurvy, and he felt that they had learned a great deal in regard to symptoms which they did not formerly think should be interpreted as scurvy. There was no question but that there was a very mild grade of scurvy that must be present before the more florid type and hemorrhagic symptoms manifested themselves, and having their attention called to these symptoms, particularly as regarded the respiration and pulse, was a very interesting and important matter.

Dr. La Fétra said that he had been very much surprised that with the increased use of pasteurized milk there had not been an overwhelming number of cases and a more severe type of scurvy occurring. He presumed this must be because so many children took other food in addition to the pasteurized milk in the form of orange juice, potato, vegetables, etc. He had not seen so many cases of scurvy during the past ten years as during the previous ten years. There was a time when he thought pasteurized milk should not be given and for years he had advocated only raw milk, but he now felt that some severe septic sore throats might be traced to the use of raw milk and that it was far more dangerous to the baby and that this danger might be avoided by feeding pasteurized milk and an antiscorbutic.

The plan of having certified milk for the great body of our people was impractical, as the expense would be too great, but by keeping in mind what Dr. Hess had said, pasteurized milk might be used without fear of scurvy.

DR. HESS said that, as he had stated in the body of his paper, if these mild cases were looked for we would find many more cases of scurvy. In the last month or two he had seen a considerable number of mild cases; the severe cases were not so frequent as formerly. This was due to a number of factors which made the child automatically less likely to develop the severe form of the disease than formerly. First, it was quite customary to add orange juice to the baby's dietary; second, even pasteurized milk was not entirely free from vitamins, and third, babies were more intelligently fed than formerly. A baby was more likely to get the severe type of scurvy if not correctly fed, or if he had had a number of intestinal upsets, than if he went along on a normal course. It therefore seemed probable, as



babies were more intelligently fed nowadays, that if they did develop scurvy it would be in the milder form.

DR. HERMANN SCHWARZ asked Dr. Hess in how many cases he had produced scurvy by feeding pasteurized milk. He said they had tried to produce it by pasteurized milk and had produced other things, but had not been able to produce even the mild type of scurvy that Dr. Hess had suggested.

DR. HESS said they had taken this matter up because the National Commission on Milk Standards seemed inclined to take the position that pasteurization destroyed no enzymes or chemical constituents in milk, and he, therefore, thought it ought to be tried out. They discontinued orange juice in a certain number of cases and a certain proportion of the children developed mild scurvy. The same thing was true of scurvy in children as was true of adult scurvy. Before it was customary to have lime juice on board ships a certain number of the men, possibly one-half, would develop scurvy, while the other would not. The same thing was true of babies; if a number of babies were placed on the same diet some would develop latent or subacute scurvy and others on that same diet would show no signs of the disease whatsoever.

#### SOME REMARKS ON THE MENTAL THERAPY OF EPILEPSY

DR. L. PIERCE CLARK said that it had long been recognized that there was a more or less definite constitutional make-up in the epileptic. The essential defects were egocentricity, super-sensitiveness, and emotional poverty both in amount and degree, and an inherent defect of ability to adapt to the so-called normal social life in its broadest significance. The main defect was an inheritable one. This make-up was the primary or original endowment of the epileptic individual. It was only accentuated and made more obvious by the development of seizures. These were then spoken of as the mental stigma of the disease. The epileptic attacks were not solely responsible for the epileptic deterioration, but the seizures were themselves symptoms and exhibitions of the deterioration involved in the disorder. The seizures did not always indicate the progress and degree of the deterioration in any given case. The precipitation of the mental factors that seemed to bring about epileptic reactions in a potential

epileptic were types of stress or annoyance which often caused a loss of spontaneous interest, and an intensive regression to day-dreaming, lethargies and somnolence. The attack occurred as the final break of a too severe mental tension and psychologically might be counted as an intense reaction from an intolerable irritation.

Sufficient clinical evidence was now at hand for us to outline more definitely the mental therapy of the essential disorder. In the make-up of the potentially epileptic child was included the instinctive inability to take on the adaptive social training of the normal child in the home and school. A morbid display of this latter defect was shown in the display of rages or tantrums. Such children should have special care from the earliest infancy, and particularly by someone specially gifted in dealing with them. Oftentimes this was best done by someone other than the parents. Great tact was necessary to size up the individual conflict of each tantrum episode and judge how it might be properly handled. At one time the child might be sidetracked by directing his interest into another channel; at another he might be completely ignored throughout the entire tantrum, especially if he be too observant of the stress his conduct generates in the family. One should be sure not to offer bribes or rewards for a restoration of proper conduct. Often such concessions were the first irreparable beginnings of a downfall of government and discipline. If the child was to be diverted to some other interest, this should always be supplied early and before any severe repressive measure was brought to bear. In these exhibitions of a balked desire, one should look upon the child's activity as a continuously outflowing stream of interest unfortunately thwarted which should not be dammed or blocked any more than an active mountain stream should be made to seek some other vicarious outlet. In the most difficult children it was best to teach the child to place his own inhibition on his bad conduct. No tantrum should be allowed to pass without a friendly and sympathetic review of all the circumstances which led up to the disorder. Tireless and tactful restatement of the great *personal* loss the child himself had suffered in consequence was necessary. The issues in question must be plain and simple, comparable with the degree of mental development to which the child had obtained. The explanatory period was often at hand long before one ordinarily would think it possible. Several children whom the speaker had known had

been given these simple talks in their third year with success. The appeal to altruistic instincts must be postponed until later. A stiffening of the will or a broadening of emotional inhibition should not be begun too early or too intensively, as fatigue might supervene. The trained observer got to know the varied signs of fatigue and was often able to tactfully lower nervous tension by quieter play. Long before the child displayed tantrums, one found much slighter but equally obtrusive manifestations of maladaptation to the simple processes of life. Often these children must be slowly and carefully inured to the unpleasant demands of hunger and fatigue, or must be slowly accustomed to the hampering and unpleasant contact of the clothing. The potential epileptic child should have less insistent demands placed upon him and for shorter periods of time than other children. His preferences for certain types of dress should also be taken into account and yielded to as far as practicable. An equally wise attitude might be assumed towards the bath and diet, and also applied to the type and character of play. Many an incentive to right conduct once implanted by the right kind of associates bore more fruitful results than many and oft-repeated injunctions by the child's elders.

Infant and child life were not without stress and conflicts. If the parents were incapable of a sympathetic understanding of what the child was striving for and his main trends of interest, then the work must be entrusted to others. A system of ethics could easily be built up around any line of activity the child might select. The incessant clamoring of the child for variety and novelty of interests was but the natural demand that was his birth-right—to experience as many of the different facts of life as possible. Our concern was not to limit these novelties, but to see that the child shall have a thoroughness of experiencing them. The very completeness with which the difficult child might be made to do this was the safest protection against day-dreams, lethargies, and like reactions from his work and play leading to boredom and irritability—the forerunners of rages and tantrums. The proper inculcation of a good system of nursery ethics was by far the most important object in training such children.

The scholastic training of the epileptic youth must be arranged to suit his peculiar make-up. Often the purely intellectual training had to be omitted and the whole time given over to tutoring the epileptic youth in social behavior. In other words, the school



training for epileptics should be intensely individualistic and very modifiable from time to time. The very monotony which the feeble-minded enjoyed in any scholastic training was poisonous to the soul of the epileptic. The latter requires novelty and a wide range of educational appeal. Moreover, in a large number of epileptic youths the intellect as such suffered but little or no impairment, and the educational training which these individuals need is little else than that which ordinarily obtains for normals, except to also teach adjustment to work and adaptations along ethical and social lines.

The differences between the feeble-minded and the epileptic were by no means purely academic. They were sufficiently common and far-reaching in significance for educators to take particular note of and govern themselves accordingly, and they should be particularly recognized by those who plan to place the two classes together in one institution. A *laissez-faire* attitude of slightly modifying a feeble-minded school to fit the epileptic should not be allowed to prevail. Much of the education is rendered useless in epileptic youths who had frequent attacks which prevented consecutive attendance at school, and the nature of their attacks involved such an amount of acute mental degradation that they really made very little use of any systematic intellectual training. In those whose attacks were infrequent and who had some intellectual endowment as well as ability to generate and direct, and finally had spontaneous interests, a system of educational training was of most value. The colonization of epileptics means most to these individuals. It supplied a continually interesting and varied environment with all the possibilities of modification from season to season, so that monotony and boredom might be avoided by such a system of living. The system of education in the schoolroom must be an essential and integral part of the occupational life of the epileptic, whether he recovers from his epilepsy or not. He needed to have his educational training coupled up with the occupations in which he was engaged and about which he cared. For instance, those interested in agriculture should have a system of book instruction and class work that would make for a further elaboration and understanding of all the daily duties grouped around this particular type of interest. The maximum of school training should be concrete rather than abstract in nature and in the lines in which the patient exhibited the keenest interest and most distinct capa-



bilities. In the absence of a spontaneous interest the remnants of former ones must be pieced together or new ones induced. This could only be carried out by actually living in close contact with the daily lives of epileptics and encouraging and assisting them to start the cold and uninviting task anew each day. Often before anything could be put into operation in the line of work and study the epileptic individual must be given many kindly explanatory talks concerning the treatment, the common-sense view taken of his disorder, and the method planned for its riddance. Until a satisfactory talk made the problem clear to the patient little could be done. The issues to be met in dealing with the problem of the epileptic could not be met except by an intense preoccupation in the minutiae of the life of such persons. Just as we had noted the inadequacy of considering the tantrum only of the potential epileptic child, so we might reiterate the uselessness of the exclusive concern of the epileptic's life at the time of, or shortly before, his attacks. To do so was to fail, in a considerable number of instances, to lose a proper valuation of the mental factors making for fits in the individual, as well as to lose sight of the broader principles concerned in the proper mental treatment of the individual case. By avoiding stressful factors and substituting other lines of activity and interest, one might introduce a mental therapy in many cases of utmost moment.

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ETHYLHYDROCUPREIN IN THE TREATMENT OF MEASLES, SCARLET FEVER AND OTHER INFECTIONS—A. D. Hirschfelder and F. W. Schlutz (*American Journal Diseases of Children*, 1916, Vol. XI., p. 361) have made tests on cases of measles and scarlet fever with ethylhydrocuprein. Their observations on scarlet fever gave negative results. In measles, however, the effects seem more promising. Eleven unselected cases were treated and showed an average duration of 4.3 days, while among 10 unselected cases occurring under the same circumstances and during the same months of the same year, the average duration was 7.9 days. Moreover, all the treated cases were free from complications, while in the untreated there were 6 cases of severe complications among 16 consecutive cases in the Minneapolis City Hospital. This preliminary publication indicates that ethylhydrocuprein is worthy of further trial in the treatment of measles.—*The American Journal of Obstetrics*.

## DEPARTMENT OF ABSTRACTS

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### ORIGINAL CONDENSATIONS OF CURRENT PEDIATRIC LITERATURE BY THE EDITORS AND THE FOLLOWING ASSOCIATES

Charles E. Farr.....New York City	Raymond B. Mixsell....Pasadena, Cal.
Morris Friedson.....New York City	Rudolph D. Moffett....New York City
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Howard K. Hill.....Philadelphia, Pa.	Mark S. Reuben.....New York City
Jerome S. Leopold....New York City	Mills Sturtevant.....New York City
William Lyon.....Jackson, Mich.	Samuel W. Thurber....New York City
John B. Manning..Seattle, Washington	Eugene F. Warner....St. Paul, Minn.
Stafford McLean.....New York City	Edwin T. Wyman.....Boston, Mass.
Carlo D. Martinetti.....Orange, N. J.	J. Herbert Young.....Newton, Mass.

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HESS, ALFRED F.: SUBACUTE AND LATENT INFANTILE SCURVY: THE CARDIORESPIRATORY SYNDROME (A NEW SIGN). (The Journal of the American Medical Association, January 27, 1917, p. 235.)

Dr. Hess reaches these conclusions: An exclusive diet of pasteurized milk will frequently induce scurvy in infants. It should be well understood, however, that this danger can readily be averted by the mere addition of an antiscorbutic food to the dietary. Probably a large proportion of infantile scurvy is occasioned at present by pasteurized milk. This scurvy is not of the classic florid type as a usual thing. It is less pronounced and obvious, and is consequently the form which is least often recognized. This type may be termed "subacute infantile scurvy" and is distinguished by a group of incompletely developed symptoms which disappear quickly when orange juice or other specific therapy is given. Another type found to be occasioned by this milk is "latent scurvy." This constitutes a state of malnutrition which develops slowly as the result of a negative balance of "vitamins." It can rarely be definitely diagnosed, except by the sharp recession of symptoms—stationary weight, pallor, poor appetite, etc.—following the administration of an antiscorbutic. We should no longer regard infantile scurvy, from either a pathologic or a clinical point of view, as a disorder affecting merely the blood vessels and the bones. Roentgenograms show that the heart, especially the right heart, is frequently enlarged, and that there is a broadening of the shadow at the base of the heart at the site of the great vessels. Furthermore, this disorder is associated frequently, even in the mild forms, with a cardiores-

piratory disturbance characterized by a very rapid pulse, and respirations which may rise as high as 60 a minute (polypnea). Both of these signs disappear rapidly when orange juice and potato are given. This cardiorespiratory syndrome is due to involvement of the nerves. Considered in conjunction with the changes of the optic disc, previously described, and the increasing of the knee reflexes, it is evident that the nervous system is extensively involved in infantile scurvy. This fact gains added interest in view of the marked involvement of the nervous tissue in other so-called "deficiency diseases," such as adult scurvy, beri-beri and pellagra.

HAROLD R. MIXSELL.

ZINGHER, ABRAHAM: THE SCHICK TEST IN POLIOMYELITIS, SCARLET FEVER, MEASLES AND IN NORMAL CHILDREN: ITS BEARING ON THE QUESTION OF NATURAL IMMUNITY. (*American Journal of Diseases of Children*, March, 1917, p. 247.)

Dr. Zingher draws the following conclusions: (1) The Schick test is positive between one and four years of age in about 32 per cent. of normal children, in a slightly larger proportion of cases of measles, in twice as many cases of scarlet fever and nearly three times as many cases of poliomyelitis. (2) Susceptibility to one of the less contagious diseases like poliomyelitis, indicates that the child is more apt to be susceptible to other contagious and infectious diseases. (3) Natural immunity reveals interesting problems which can be partly solved by a study with the Schick test in diphtheria immunity. (4) A uniform technic of making the test, standard solutions of toxin, a uniform interpretation of the test, and a large series of cases are essential in any attempt at making important deductions from the results obtained with the Schick reaction.

HAROLD R. MIXSELL.

QUINBY, WILLIAM C.: PYELITIS IN CHILDREN. (*The Journal of the American Medical Association*, February 24, 1917, p. 591.)

The author draws the following conclusions: It is to be noted that pyelitis in children is more often a serious or even fatal malady than has been thought in the past. Though female children are attacked more often than male, this difference is not so great as was held by the earlier writers. The origin of the disease seems quite surely to be from the intestinal tract in a

good many cases, but the theory of infection ascending from the lower urinary tract cannot yet be entirely disproved. Medical treatment has been too haphazard heretofore. It should be based on the accurate knowledge gained by estimation of the properties of the specific infecting organism. This can be obtained by determining the hydrogen ion concentration of cultures both of the organism and of the urine. Pediatricians and internists have not yet appreciated the value and possibilities of pelvic injections. Wherever possible this should be urged in those cases in which the urinary tract does not become entirely free from infection within a reasonable time.

The author's two main objects in calling attention to this subject are to advocate a treatment based on the use of the newer and more accurate methods of bacteriology, and to remind our colleagues, the pediatricians, that for those few cases which resist this treatment, the urologist can often place at his command a method of local treatment which holds high hopes of success.

HAROLD R. MIXSELL.

SINCERBEAUX, GEORGE C.: TYPHOID FEVER IN CHILDREN. (New York State Journal of Medicine, March, 1917, p. 110.)

The author points out the fact that the course of typhoid fever in children is relatively mild except in infants. It is liable to be shorter and the prominent symptoms often demonstrable in the adult are less marked or wanting, these only being seen in relapse cases. Prodromal symptoms are slight. The attack is ushered in, as a rule, by slight malaise and gastrointestinal disturbance, vomiting and constipation being the rule, diarrhea, if any, appearing later. The temperature rises slowly for the first few days, running evenly with slight morning remissions during the second week and declining slowly until normal. The tongue may be clean, but more often covered with a thick, white layer, with clean tip and margins oftentimes exhibiting the V-shaped red place, or typhoid triangle in the center of the tip, which is claimed to be pathognomonic. Loss of appetite and weight are common. The pulse is usually slow in relation to the temperature unless there are heart changes. The younger the child the less the nervous symptoms, usually the only evidence being apathy and restlessness at night. In severe cases there may be tossing in bed, tremor of hands, picking at the bed clothes, delirium, convulsions and signs of meningeal irritation. The spleen is enlarged,



reaching the free border of the ribs at the end of the second week. The roseola, which may or may not appear, is seen during the second week on the abdomen or chest. The abdominal symptoms are varied. Diarrhea, which usually appears late, gives the characteristic pea-soup appearance. Hemorrhage and perforation are rare except in older children. The urine is usually scant and sometimes contains albumin and casts. The Diazo reaction is generally present until the end of the third week. Widal reaction is present. The mortality is small, averaging 5 per cent. The treatment of typhoid in children is similar to the treatment in adults, special emphasis being laid on the prophylaxis and sanitation.

HAROLD R. MIXSELL.

ZINGHER, ABRAHAM: THE DIAGNOSIS AND SERUM TREATMENT OF ANTERIOR POLIOMYELITIS. (*The Journal of the American Medical Association*, March 17, 1917, p. 817.)

Zingher draws the following conclusions from a large series of cases seen at the Willard Parker Hospital and in private during the epidemic of last summer: (1) The injection of immune and of normal human serum into the spinal canal during the acute febrile stage of poliomyelitis causes a distinct cellular reaction which is mostly polynuclear in type. (2) The phagocytic action of these cells is beneficial in poliomyelitis. (3) Such action is enhanced in immune serum by the presence of specific antibodies. (4) It is preferable to use fresh serum or serum which has been passed through a Berkefeld filter under sterile precautions and bottled without the addition of a preservative. (5) The presence of a preservative and of hemoglobin in serum enhances its irritating effect, and gives rise to the more severe types of reaction. (6) For purposes of treatment, it is important to diagnose the cases during the preparalytic stage of the disease by the typical group of early symptoms and the changes in the spinal fluid. (7) These symptoms are fever, slight rigidity of the neck, jerky movements and fine tremors of fingers and hands. (8) The diagnosis of poliomyelitis can generally be confirmed in the early stages of the disease by a bedside examination of the spinal fluid, which shows macroscopically the ground-glass appearance and a positive foam test. The laboratory examination will show an increased number of lymphocytes, an increased amount of albumin and globulin, and a marked reduction of Fehling's solution. (9) Parents should be instructed to recognize the early

symptoms so as to notify promptly the family physician. This is especially important in detecting secondary cases in the same family.

HAROLD R. MIXSELL.

HIPSLEY, P. L.: REDUCTION OF AN INTUSSUSCEPTION IN A CHILD OF SEVEN MONTHS. RECOVERY. (*The Medical Journal of Australia*, January 13, 1917, p. 30.)

Onset of vomiting in breast-fed baby for twenty-four hours without apparently any severe pain. Blood and mucus appeared in stool on second day. At this time the infant was listless, eyes sunken and appeared very ill. All the muscles were flaccid and the usual sausage-shaped tumor could easily be palpated. The temperature was 97°F. and the pulse rate 100. Thirty-six hours after onset of vomiting the intussusception was exposed by incision just to right of median line. The last four inches could not be reduced and a lateral anastomosis between the terminal portion of the ileum and a healthy portion of the colon above the intussusception was made and the affected portion of the bowel was removed. There followed a bronchitis for five days, with temperature 101°-102°. Breast feedings were resumed in twenty-four hours after operation. One pound was gained in weight in three weeks. Dr. Hipsley states that recovery after resection for irreducible intussusception in an infant under one year of age is exceedingly rare.

JOHN B. MANNING.

ABT, ISAAC: FAMILIAL ICTERUS OF NEWBORN INFANTS. (*American Journal of Diseases of Children*, March, 1917, p. 231.)

Pfannenstiel in 1908 gave the first detailed description of familial icterus of newborn infants when he described two fatal cases and collected the scattered reports of others in literature. Its cause is unknown, and at present there is no evidence to prove that it is due to septic processes. It is not present at birth, but appears during the first days of life. In none of the cases is there a history of birth injury, nor does it seem to be due to toxemia of pregnancy. The disease may occur in successive pregnancies. As a rule there is no hereditary influence, nothing of a similar nature being discovered in the family of the father or mother. The disease usually begins on the first or second day of life and increases rapidly in severity. Pfannenstiel briefly described the symptoms by referring to the presence of catarrhal conditions of the mucous membrane, sometimes with

bloody discharge, though true melena does not occur. The stools are catarrhal in character and are frequent; the urine contains bile pigment; the patient may show meningeal irritation, with characteristic crying and whining. At the onset there may be hyperemia of the skin. If the disease continues, hemorrhages from the various mucous surfaces and into the skin, as well as from the umbilicus, occur; death follows soon from collapse. Atonic convulsions, particularly of the upper extremities, as well as opisthotonos, are frequently observed. There is evidently no relationship to syphilis. The disease has nothing in common with chronic family jaundice in which the patient experiences but little inconvenience and may attain an advanced age.

The author draws the following conclusions from 2 cases seen by him: These reports relate the occurrence of a rare disease in newborn children, characterized by progressive icterus occurring in successive pregnancies and of unknown origin. The disease nearly always terminates fatally, though one of the author's cases recovered after a most serious attack and with the most alarming symptoms.

HAROLD R. MIXSELL.

LACKNER, E. AND GAUSS, H.: ACIDOSIS IN CHILDREN, WITH REFERENCE TO THE PATHOLOGIC ANATOMY. (*American Journal of Diseases of Children*, March, 1917, p. 209.)

Acidosis has been described by Abt as occurring in robust children who have been previously healthy. Following a period in which the child's weight remains stationary and in which dissatisfaction with the food is shown, the disease becomes manifested by diarrhea, vomiting and a febrile reaction lasting a few days, after which there occur abdominal distention and pronounced dyspnea characterized by rapid, labored respiration of wide amplitude; the liver becomes palpable, with firm, round edges, the urine contains albumin, casts and the acetone bodies; in a few days the child passes into coma which is apt to terminate fatally. On postmortem examination the liver and kidneys are found to have undergone fatty changes. This paper reports the clinical course and necropsy in a case believed to be one of acidosis, and an attempt to correlate the anatomic alterations with the clinical diagnosis. The authors' conclusions follow: (1) There occurs in acidosis, lipemia from the failure of the body tissues to utilize the fat in the blood. (2) Lipuria, an outward expression of lipemia, also resulting from the excretion

of fat in the waste products of the kidneys as fatty casts. (3) Fatty infiltration of the liver, which is a physiologic accumulation of fat from the blood. (4) Fatty degeneration of the kidneys resulting from acid intoxication. (5) Anasarca resulting from impaired internal and external respiration.

HAROLD R. MIXSELL.

SCHLOSS, OSCAR, AND STETSON, RUFUS: THE OCCURRENCE OF ACIDOSIS WITH SEVERE DIARRHEA. (*American Journal of Diseases of Children*, March, 1917, p. 218.)

Drs. Schloss and Stetson arrive at the following conclusions: Infants suffering from severe diarrhea with toxic symptoms often show the following signs of acidosis: (1) Decrease of the carbon dioxid of the blood and alveolar air. (2) Decreased carbon dioxid combining power of the blood plasma. (3) High ammonia coefficient in the urine. (4) Increased tolerance to sodium bicarbonate. (5) Improvement of the symptoms after administration of sodium bicarbonate.

These signs are evident in some cases of diarrhea before the typical symptoms of intoxication have developed, and serve as a warning and therapeutic indication.

If an infant suffering from severe diarrhea has hyperpnea, the diagnosis of acidosis is almost certain. If hyperpnea is not observed the diagnosis of acidosis must rest on laboratory evidence. Thorough and carefully controlled treatment by sodium bicarbonate usually causes disappearance of the acidosis, but despite this, the infants frequently die from a severe form of malnutrition.

HAROLD R. MIXSELL.



## BOOK REVIEWS

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BETTER BABIES: A GUIDE TO THE PRACTICAL CARE OF THE MOTHER AND THE YOUNG CHILD. By SAMUEL A. VISANKA, Ph.G., M.D., Formerly Professor of Therapy and Practice of Pharmacy, Southern College of Pharmacy; Founder Children's Clinic, Wesley House; Physician to Home for Incurables; Former Chairman Milk Committee, Atlanta Chamber of Commerce. Atlanta, Ga.: Foote & Davies Company. 1917.

This is a short book of 250 pages. The reviewer feels that it will find its place as a semi-reference book for nurses and mothers, as it is clear and concise and does not venture too deeply into the water of scientific explanation. In other words, it is not over their heads. Two things alone would recommend the book, and these are "The new navel band, and the new way of putting on a diaper." The navel band recommended is an elastic one made by the Mann Elastic Bandage Company. It is sanitary, can easily be washed, is not expensive, and is practically everlasting. The arrangement of the diaper was called to the attention of the author by a Chicago woman. Instead of the usual plan of folding the diaper in a triangle, with the point pulled upward and the ends fastened tightly around the waist, the napkin is folded in a long strip, the cloth cut almost square, being a trifle longer than wide. To fasten this diaper, two safety-pins are used, one on each hip of the child, thus securing the napkin comfortably, and at the same time affording the ample protection needed, while avoiding undue pressure on any organ or set of organs. These two innovations are real dress reforms for babies. The book contains numerous illustrations and is well printed.

MY BIRTH: THE AUTOBIOGRAPHY OF AN UNBORN INFANT. By ARMENOUHIE T. LAMSON. New York: The Macmillan Company. 1916. All rights reserved.

This is a most unusual book inasmuch as it takes up in detail, from a mother's standpoint, a subject which is increasing in public interest almost hourly. The questions of motherhood and the prenatal life of a baby should be placed before the young of

the country in a way which makes them easily understood. Embarrassing questions may be obviated by straightforward instruction, and this "My Birth" does and does well. As the title indicates, it is an autobiography of an unborn infant. It is embryology told in words of one syllable, and copiously illustrated to emphasize the points made. We welcome its birth.

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BEESTINGS AND BEE-POISON AS A THERAPEUTIC MEASURE IN CHRONIC RHEUMATISM—Joseph Langer (Jahrb. f. Kinderheil., March 8, 1915) says that the pediatricist seldom encounters chronic rheumatism in children, in whom the acute form is most frequent. One sees centrifugal and centripetal forms of chronic rheumatism of deforming type, rarely with heart complications. The joint lesions are always symmetrical, which favors the theory of a trophoneurosis. The joints and surrounding tissues are swollen, stiff, almost paralytic, shining and tender. Pain prevents active and passive movements of the joints. Such children are entirely helpless. The etiology of this disease is not settled. The therapy includes all sorts of general medication, which goes to show that we are dealing with a fault of metabolism at present not understood. The writer gives histories of 3 cases treated by him with bee-poison. The treatment is exceedingly painful and is therefore seldom applied to children. But Turc and his followers have formulated a regular system of treatment by this method. It is carried out for long periods and large numbers of bees are applied to the same patient at one treatment, as many as 150 beestings being received at one sitting. The points of the stings appear after a few days as points of necrosis with a wall of leukocytes built around them. Injection of bee-poison into the conjunctival sac causes swelling of lids, closure, hyperemia, chemosis, and purulent exudation. The beesting is a slightly diffusible poison causing inflammatory swelling. It acts as a counterirritant to the tissues beneath it. The thickening of the circulation causes a carrying away of disease products and may kill the germs causing the disease. The bee-poison is also a bacterio-free secretion with the power of killing bacteria. The author obtained an extract of bee-poison by removing the sting and macerating in water. This he used in children as an injection, this method proving less painful than the beestings themselves.—*The American Journal of Obstetrics.*

# ARCHIVES OF PEDIATRICS

APRIL, 1917

ROYAL STORRS HAYNES, PH.B., M.D. }  
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PUBLISHED MONTHLY BY E. B. TREAT & CO., 241-243 WEST 23D STREET, NEW YORK

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## ORIGINAL COMMUNICATIONS

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### MEASLES FROM THE STANDPOINT OF PREVENTION \*

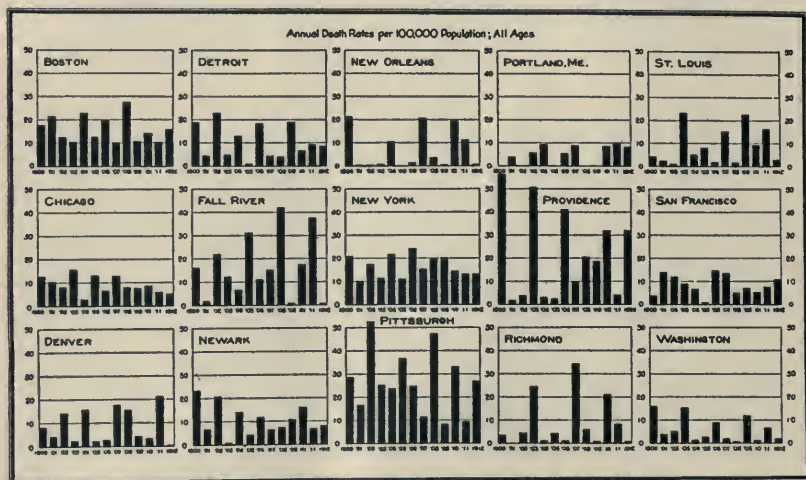
BY J. G. WILSON, M.D.

Assistant Surgeon, U. S. Public Health Service, Ellis Island, New York

*Legislation Affecting Measles*—From the standpoint of prevention, notification and quarantine have not materially affected the incidence of measles epidemics. It may be possible to show that particular epidemics have been shortened by measures taken with that end in view, but if we review the situation as a whole, we will find that there is no constant relation existing between laws regulating the control of the disease and the rise and fall of epidemics. Frederic Crum tabulated the periodicity of measles

\* Read before the 7th Annual Meeting of the American Association for Study and Prevention of Infant Mortality, Milwaukee, October 19-24, 1916.

outbreaks in fifteen representative American cities for thirteen years from 1900 to 1912 inclusive. A study of his chart does not show any tendency whatever towards constant abatement either in the frequency of epidemics or their severity.



Periodicity of Measles Epidemic in 15 representative American cities from 1900 to 1912, inclusive. Frederick Crum. Publication of Prudential Life Insurance Company

Realizing the failure of notification and quarantine to effectually prevent the spread of measles, there is a tendency on the part of some health officers to relax the enforcement of existing laws. As early notification and prompt isolation are from a theoretical standpoint entirely adequate to prevent epidemic measles, it would seem that some way ought to be found to put the theory in practice. Effort in this direction has so far been exerted in a diversity of ways. This is shown by an analysis of the various state laws and regulations dealing with the subject. Up to January 1, 1916, 38 states out of the 52 states and possessions of the United States required notification.\*

Some states require notification and placarding of the house only. Some require strict quarantine of all the members of the household, some of the patient only, and others of the patient and exposed persons. If we consider cities as well as states, we

\* Those not requiring notification are: Colorado, Florida, Kansas, Missouri, New Jersey, New Mexico, North Carolina, Oklahoma, Porto Rico, Rhode Island, Tennessee, Texas, West Virginia and Wyoming.—*Reprint No. 332 of Public Health Reports.*



find that the duration of quarantine varies in different communities from five days to three weeks. From a consideration of these facts, it is evident that one of the first essentials is, not more drastic legislation, but a standardization of existing laws and regulations and their uniform extension to all communities.

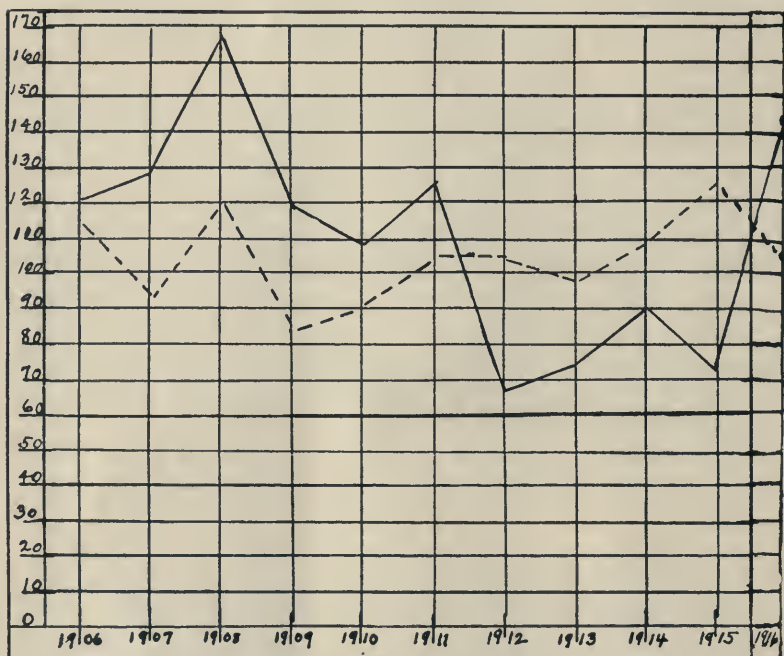
Given a uniform and sensible notification and isolation law in all the states, the question would then arise how best to apply that law.

*Applications of Notification and Isolation Regulations*—In the present state of our knowledge, prompt isolation of beginning cases is undoubtedly the only way in which epidemics may be nipped in the bud. As a rise in temperature is the first clinical symptom of the period of invasion, it follows that prompt isolation of all susceptible persons with fever, however slight, should prevent serious measles outbreaks. Experience at the Immigrant Station at Ellis Island, New York, in large measure substantiates this opinion. Children under fourteen years of age have comprised ten per cent. of all arriving aliens at that port for the past ten years. There have never been wide variations from this average. Notwithstanding the practically constant distribution of susceptible persons the yearly incidence of the disease has varied greatly.

For different reasons many immigrants are detained in large rooms and dormitories in the general administration building for periods varying from twenty-four hours to several days. Fresh measles virus is introduced by new arrivals at frequent intervals.

As a consequence of this detention, nearly one-fourth of all our measles admissions have been derived from the waiting rooms and dormitories of the administration building. In an effort to abate as far as possible this undesirable condition, Dr. L. L. Williams, the chief medical officer in 1915, instituted the plan of taking the temperature of all detained children twice every day. All children with temperature of over 99 degrees were promptly isolated. Following this procedure the proportion of cases of measles developing in the detention rooms dropped one half, and in 1916, the practice still being continued by Dr. J. C. Perry, the present chief medical officer, it did not rise above the former level of approximately 25 per cent. This failure to increase took place under conditions when a natural increase of cases from this source was to have been expected, because, during the year ending July 1, 1916, the proportion of measles cases to arriving

immigrants, not only increased twofold, but owing to difficulties in the way of deportation incident to the war, the average period of detention of all immigrants was immeasurably increased, thus making the detention rooms a veritable hot-bed for measles incubation.



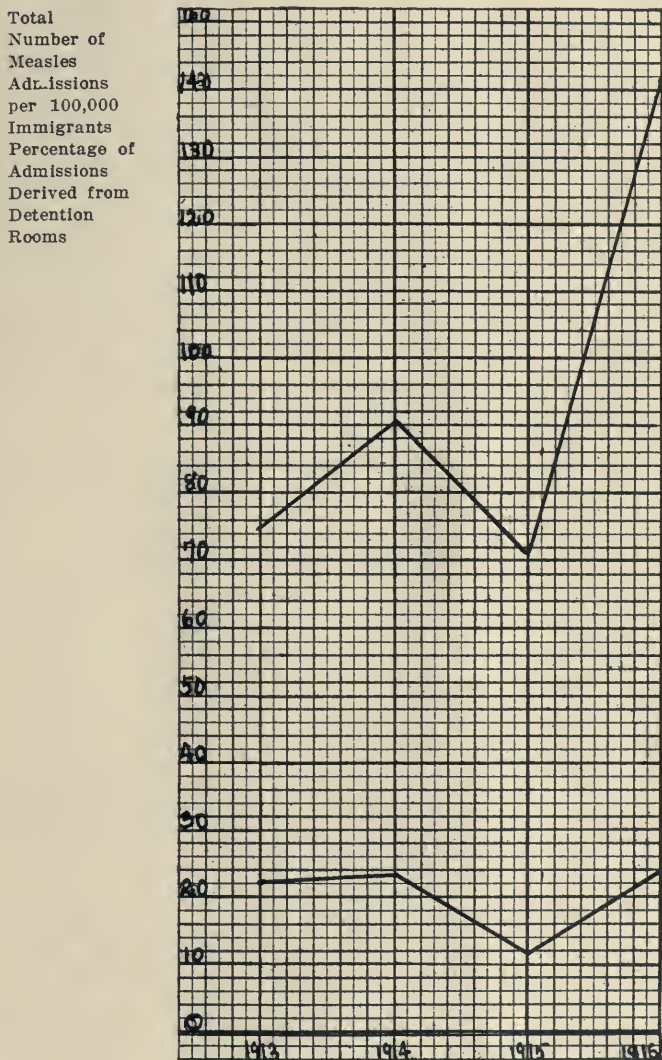
Solid line: Number of measles cases per 100,000 immigrants arriving at Ellis Island 1906 to 1916

Broken line: Number of persons under 14 years of age per 100,000 immigrants arriving at Ellis Island 1906 to 1916

If so desirable an effect can be produced under such conditions of crowding and close association as prevail at Ellis Island, it would seem that similar procedures, introduced in the homes and schools at the time when the first case of measles occurs in the vicinity, ought to go a long way towards preventing general epidemics.

Taking the temperature of the non-immune population involves detail in its practical application which would have to be worked out by co-operation of the family physician, the school authorities and the local health officers. The difficulties to be encountered should not be very great.

Assuming then that a plan be evolved in any given community to detect all temperature rises as soon as the first cases appear



Prevention of Measles Outbreaks in Immigrants' Detention Quarters by Daily Temperature Records of all children. Temperature Taking Started in 1915.

and an epidemic threatens, the next practical question presenting is that of isolation. This will have to be accomplished through

education along two lines. In the first place the private physician must insist on the complete isolation in a separate room in the home of all his susceptible patients who exhibit temperature rises from any ill-defined cause. In other words, the public must be educated to the view that any rise in temperature in children may be due to a contagious disease.

Many homes will be unable to afford proper isolation facilities; this will necessitate early hospitalization of all suspected cases, and this is the second line along which education must be extended. Here, however, it is not the lay public alone which needs education, but it is the private physician, the health officer and the hospital architect who must be taken in hand. So long as the measles death rate in hospitals remains at its present high level, we cannot expect parents to voluntarily risk the lives of their children solely to prevent the spread of infection to others.

*Serious Complications, Cross Infections and Death Rates in Relation to Isolation Facilities*—There can be no doubt that more success has heretofore actually attended home treatment than hospital, but it can be shown that when hospital conditions are changed so that isolation facilities are adequate, just as great success will attend this method of treatment as has attended the former. There have not yet been constructed any hospitals with absolutely adequate isolation facilities. By such hospitals are meant those in which it is never necessary to take any chances of patients directly infecting each other. This means that every child must be kept in isolation for a period of time that not only absolves it as a source of danger on account of the disease for which it has been treated, but which also covers the incubation period of every other contagious disease which it has *not* had.

At Ellis Island Hospital there has been an effort to achieve this ideal, but so far the goal has not been reached. There has, however, been great improvement. If we compare the years when isolation facilities have been decidedly inadequate with those when they have been considerably better, the improvement in the results is so marked that we cannot help but believe that it will eventually be entirely possible to eliminate every objection that may be raised to hospital treatment.

In 1912 there were only 633 admissions for all causes. Five hundred and two of these were measles, leaving approximately only one-sixth of the hospital population as a possible source of cross infection. Moreover, the admissions were in small groups,



so that the hospital was never suddenly overtaxed. That year, therefore, can be classed as fairly good for isolation facilities because there was provision for keeping this one-sixth of the population away from the rest during the greater part of the convalescent period of both groups. In 1913 and 1914, the isolation facilities were poor. In these two years there were 2,256 admitted for all causes; 1,675 of these were measles, leaving one-fifth of the hospital population as a possible source of cross infection. Patients were often admitted in groups of 20 or more at one time. There were not sufficient facilities to even approximate adequate isolation during the greater part of these two years.

In 1915, the total number of admissions for all causes was only 383. One hundred and ninety-one of these were measles, leaving one-half of the population as a possible source of cross infection. This greater chance was, however, largely offset by the even distribution and small numbers of admissions, so that isolation facilities in reality approximated those of 1912.

In 1916, the chances of cross infection were the greatest of all. This year there were 960 admissions for all causes, which number almost equalled the yearly admissions in 1913 and 1914. There were 252 measles cases admitted, 22 of which were suffering from a coincident scarlet fever at the time of admission. There were 200 cases of scarlet fever, 11 of whom were suffering from super-added measles. Altogether there were some 300, or one-third of the hospital population which was a possible source of cross infection to the measles cases. Besides this, the admissions were very irregular and often in large groups, over 40 cases having been admitted in the course of a few hours on several occasions. Fortunately, 12 more isolation units had been added and we were able to manœuvre so that we did not have to take chances, except in a few instances. Therefore, this year is grouped among those with fair isolation facilities.

Arranging the years according to isolation facilities and setting opposite each series the case fatality, serious complication and cross infection, we have the following results:

*Series I., Comprising Years 1913 and 1914\**—Patients admitted in large groups—often over 20 measles cases inside of two hours—sometimes 40 or 50 in a single day—many cases admitted and necessarily placed in general wards before diagnosis

\* Year ends July 1st.

could be absolutely established. The two years 1913 and 1914 are therefore classed in the *years with poor isolation facilities*.

Of the 1,675 measles admissions for these two years 21 per cent. suffered from serious complications (bronchopneumonia or enterocolitis); 3.2 per cent. suffered from cross infection, and the case fatality was 10 per cent.

*Series II., Comprising Years 1912, 1915 and 1916*—In the first year of this series, admissions were evenly distributed, measles cases never coming in large numbers in any given day. There was also a small number of other contagious diseases in the hospital, measles forming nearly five-sixths of admissions for all causes. In the second year of this series the total number of admissions for all causes was so low and distribution so even that facilities were relatively speaking not overtaxed. In the third year of the series there was a very uneven distribution of the admissions and large numbers of other contagious diseases were admitted, but this was largely offset by a substantial increase in the number of isolation units. The three years, 1912, 1915 and 1916, are therefore classed in the series of *years with relatively good isolation facilities*.

Of the 949 admissions for measles for these three years 10.5 per cent. suffered from serious complications (bronchopneumonia or enterocolitis) as contrasted with 21 per cent. of the first series; 2.2 per cent. suffered from cross infection as contrasted with 3.2 per cent. in the first series, and the case fatality was 6 per cent. contrasted with 10 per cent. in the first series.

*Serious Complications and Cross Infections in Relation to Measles Death Rate*—The high mortality of measles treated in hospitals has undoubtedly been due to the greater incidence of bronchopneumonia, enterocolitis and cross infections. That these are in reality serious complications can be readily appreciated by attention to the table which appears in the 1916 Transactions of the American Association for the Study and Prevention of Infant Mortality.

Summarizing the most important points we find that out of 1,059 measles cases with serious complications (otitis media included) 178 died, giving a general case fatality of 16.8 per cent. for the complicated cases. Of the 157 cases of cross infection 47 died, giving a case fatality of 30 per cent. for this class of cases. The total 157 cross infections noted in the table show that 6 per

cent. of the measles cases were thus affected. An analysis of the individual cases with reference to whether the cross infection was contracted prior or subsequent to admission, is contained in the extended table to be found in 1916 Transactions of the American Association for the Study and Prevention of Infant Mortality.

The question of whether the secondary infection occurred before or after the patient was admitted to the hospital was in many instances impossible of exact determination. In order to arrive at a fair opinion, a third doubtful class is added. For the purpose of this classification I have regarded any case developing measles before the ninth day of admission as having contracted his infection before admission and after the eighteenth day as having contracted it in the hospital. Those developing the infection between the ninth and eighteenth days have been considered as doubtful cases. They may or may not have been infected in the hospital. While this is not an absolutely accurate method of determining the truth of the matter it is believed to approximate the truth as nearly as possible. Undoubtedly there are cases where the symptoms of measles have been delayed for more than eighteen days after exposure, and possibly there are some authenticated cases where they have been noticed before the ninth day, but the consensus of opinion seems to be that the general average of fourteen days is but seldom subject to more pronounced variations than these. I have dated the onset of measles from the appearance of the catarrhal symptoms.

Adopting the same general principles in regard to incubation periods of the other disease, I have diagnosed as diphtheria only those cases which were both clinically and bacteriologically such. Diphtheria carriers are not included in this list. Any case thus developing diphtheria before the third day's residence in hospital was regarded as having contracted the disease before admission. From the third to the fifth day it has been regarded as doubtful, whereas after the fifth day it has been considered as a case of infection occurring in the hospital.

Scarlet fever has been diagnosed as such from the first appearance of the rash. All cases occurring before the third day as having contracted the disease before admission. From the third to the eighth day it has been regarded as doubtful, and after the eighth day as cases of hospital infection.

Chickenpox was regarded as having been contracted in the hospital if it occurred before the sixteenth day. The fourteenth



to sixteenth day was considered doubtful, while under fourteen days it was regarded as occurring before admission.

Mumps was considered doubtful if occurring between the seventeenth and twenty-first days; before the seventeenth day as before admission, and after the twenty-first day as a hospital infection.

Whooping-cough was counted as such from the first characteristic whoop and sixteen days was assumed to be its incubation period. Any case developing under a sixteen days' stay in hospital was considered as having contracted the disease before admission and any after that as a case of hospital infection.

German measles contracted under ten days was considered as an outside infection; twenty-one days and after as a hospital infection, and between those times as doubtful.

Eighty-four were exposed to the second disease prior to admission, leaving 73 who contracted the disease either after admission or at a time when the incubation period would place them in the doubtful column. If we consider the whole 73 as having contracted the second infection subsequent to their admission to hospital this will give us a percentage of 2.7 cross infection to be charged against faulty technique or unavoidable exposure.

A perusal of reports from the few institutions where aseptic nursing and the barrier or cubicle system is in vogue would lead one to infer that 2.5 per cent. or 3 per cent. of cross infections is a sort of irreducible minimum of bad results which represents a maximum of efficient technique.

Experience at Ellis Island does not justify such self-satisfied complacency. In practically every instance, the cross infection could be traced to some fault of technique on the part of the doctor, ward maid or nurse or to some difficulty inherent in the hospital construction. To remedy the first evils, those incidental to faulty technique, an entire reconstruction of our ideas as to the proper financial remuneration of ward maids, nurses and internes is necessary. The aseptic nursing of contagious diseases should be a highly paid profession which could be entered only by those showing natural adaptability after a long and special course of training.

The ward maids should also be looked upon as highly skilled laborers and paid accordingly. The admitting physician should be well trained and well paid, and internes should be compelled to serve a probationary period before going on the ward alone, and



they should also receive some compensation besides board and lodging.

A lack of proper appreciation of the foregoing facts constitutes the chief reason for faulty technique in all hospitals handling cases by the new method.

To remedy the evils due to faulty hospital construction will also take much recasting of old ideas. Large wards or even those with ten or twelve beds should be abolished. Almost without exception convalescent children should be allowed to recover completely in their own little cubicle and the so-called convalescent ward should be relegated to the past. Experience at the Ellis Island Contagious Disease Hospital has shown that convalescent children are more contented alone than with others, *provided they can see the others*. The glass partitions or large glass windows between cubicles, with a fair supply of toys for each child insures more individual and general tranquillity than the open ward where all mingle freely. In a hospital constructed along such lines and adequate provisions for service rooms and proper nursing, the conditions surrounding the child with measles will be equally good as those in the best homes. Moreover, in such a hospital, all diseases of children, contagious and non-contagious alike, could be freely and safely admitted. The danger from cross infection and the serious complications would be those inherent in the individual case and no added danger would accrue from hospitalization.

*Acquisition of New Knowledge*—Although it can be truthfully said that the prevention of measles is entirely possible with the means already at our disposal, it cannot be denied that the problem would be greatly simplified if we were able to safely produce an artificial immunity. Theoretically we knew how to prevent typhoid fever by sanitary measures alone, but practically it was necessary to involve the aid given by vaccination before the problem was in reality solved. Some similar procedure must be invoked before measles is taken out of the column of preventible diseases and placed in the column of disappearing or obsolete diseases.

In an effort to produce artificial immunity, Charles Hermann, of New York City, has reported the successful inoculation of 40 infants under five months of age. \*

\* "Immunization against Measles," Charles Hermann, ARCHIVES OF PEDIATRICS, July, 1915.

He obtained the virus from the nasal mucus of otherwise healthy children twenty-four hours before the appearance of the measles eruption. He did this on the assumption that in children under five months measles is practically always a mild infection. By giving them this mild or modified form of the disease, he claimed to confer an immunity which would protect them against the severer forms. Although his experience apparently justifies his belief it is difficult to reconcile his results with our own experience of measles in infants.

For the five years ending July 1, 1916, out of 2,614 cases of measles treated at the Contagious Disease Hospital at Ellis Island, there were 32 who were under six months of age. Seven of these died, giving a case fatality of 21.8 per cent. for this group. Eighteen of the 32 were under five months, 5 of these died, giving a case fatality of 27.7 per cent. for infants under five months of age.

This series of cases alone should be sufficient to warrant a conservative attitude towards the practice of inoculation for the prevention of measles.

It is along the lines indicated by the experimental inoculations of monkeys that further efforts to discover preventive methods seem to hold the most promise. The work of Hektoen and Eggers, Nicoll and Conseil, Lucas and Prizer, and Anderson and Goldberger all goes to show that the virus of measles can be recovered from the blood for a period of about twenty-four hours before the appearance of the eruption. Anderson and Goldberger\* passed the strain of measles virus through six generations of monkeys.

The work of these investigators was by no means completed. They discovered the virus during the stages of leucopœnia and invasion. It remains to be determined at exactly what stage the virus first appears. There is reason to believe that it is actually present long before the period at which Anderson and Goldberger recovered it. Ruhräh† has shown that for five or six days before the appearance of the catarrhal symptoms there is a transient lymphocytosis and a steady daily decline in body weight.

Daily studies of the blood, including inoculation experiments should be commenced immediately after known exposure, in the hope that at some stage of the incubation the organism itself

\* Anderson and Goldberger, *American Journal of Diseases of Children*, July, 1912, Vol. IV., pp. 20-26.

† John Ruhräh, *New York Medical Journal*, April 24, 1914.

might be recovered. This feat once accomplished the way would be open for the production of intelligent vaccine or serum therapy, or the discovery of a safe method of producing an artificial immunity.

*Recapitulation*—The problem of measles prevention should be approached along the following lines:

1. Standardization of present laws and adoption of same by all state and local health boards.
  2. Early detection of cases to be accomplished by coöperation of school and health authorities with the family physician.
  3. A complete reform of hospital construction and management of cases in hospital so that hospitalization may be made both popular and efficient.
  4. A persistent effort to isolate the organism of the disease in order that an intelligent effort may be made to produce artificial immunity.
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PROTECTION OF INFANCY IN FRANCE—A. Pinard (Ann. de gyn. et d'obst., March-April, 1916) continues his account of the results of public care of the "war babies" in Paris. His first account was of the first five months of the war. The present one includes an entire year. The work included the care of every woman known to be pregnant whose husband was at the front, who was a war widow, or whose child was the result of a conception with a soldier out of wedlock. The accommodations in maternity hospitals were increased, advantage was taken of all private charities in this line of work, the distribution of sterilized milk was much increased, and homes were provided for nursing mothers who were homeless. The results of this care have been a decrease in mortality of infants at birth and of puerperal women; a diminution of mortality of infants between one day and three years of age; a lessened number of abandoned infants; and an increase in the duration of pregnancy and in the weight of the newborn. During the first year of the war, births registered numbered 37,085, of which 24,431 occurred in maternity hospitals. In the refuges for nursing mothers 4,000 children were cared for with their mothers, and only fifteen died. The author believes that these results have justified a permanent public assistance for pregnant women and nursing mothers in Paris.—*American Journal of Obstetrics*.

## PELLAGRA IN CHILDREN

BY WM. A. MURPHY, M.D.

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Pellagra has been known for over two centuries in Europe; it has been referred to under the names of *mal de la rose*, *mal del sol*, *lepra Asturiensis*, *scrobutus Alpinus*. It is most frequently seen in Spain and Italy. The name pellagra is Italian in origin—*pelle agra*: rough skin. Austria, Italy and Roumania are chief centers of the disease in Europe to-day. It was in these countries, especially in Italy, that the theory of spoiled maize as the cause originated. Sambon of London, as long ago as 1903, announced that there was no foundation for this belief. He proposed the theory that it was an insect bourné parasitic disease. To-day this is thought to be as far from the true condition as the former maize theory.

A case of pellagra in New York was noted by Sherwell about 1883; in 1902 Harris of Georgia reported a case there. The first series of cases in America was reported by Searcy, who recognized them among the insane in Alabama. In the same year Babcock of South Carolina, working independently, collected a series of nine cases, which he reported to the South Carolina Board of Health. He was able to trace probable cases, in the State Hospital for the Insane, as far back as the years 1828 and 1834.

While not of recent origin in America, the more virulent type of cases was not observed until the last decade.

Wood says: "My experience with pellagra is that early in the appearance (1905 to 1909) the disease was quite malignant, often killing after a course of a few weeks, and since then there has been brought about a general attenuation until now it is common to find barefoot children in all sections with definite skin lesions and enough other skin symptoms to justify a diagnosis. Such cases never come under the care of a physician, except accidentally."

Goldberger has done some interesting work in the etiological factors, and feels sure that it is absolutely preventable by an appropriate diet. He is continuing the work for the United States Public Health Service along this line. The Thompson-McFadden Commission's findings in Spartanburg, S. C., were



interpreted otherwise, more stress being placed on proper hygienic surroundings than the low protein or "faulty" food.

As for its distribution in America, cases have been reported from California to New York and from Louisiana to Michigan, and Nova Scotia. It is more than probable that sporadic cases have occurred for the last fifty or sixty years. Certainly for the last ten years it has been epidemic, especially in the Southern states.

With such strikingly contrasting statements regarding its possible etiological factors from those who have made a study of pellagra as: "Pellagra is in all probability a specific infectious disease communicable from person to person by means at present unknown;" and "These experiments strengthen the conclusion that it is a disease essentially of dietary origin brought about by a faulty, probably deficient diet"—it is not feasible to go into this discussion in this article.

Until recently the occurrence of pellagra in children, to any extent, was denied. Odoardi in 1776 had not seen it, in Italy, in children under six and eight years of age. Soler says: "Children below the age of twelve are exempt."

Numerous cases do occur, however, in young children and even infants. Weston reports in a city of 65,000 people, in the pellagrous belt, 15 cases under four years and 1 at four and one-half months. Wood has found numerous cases in his practice in a town of 40,000 inhabitants. Six occurred in one home. Definite recognizable cases in children under the age of twelve months are rare. In a recent series of 1,180 cases living in their own homes, under careful observation, there were 14 children under the age of two; 3 of them were in the first year of life and 11 in the second. There were 20 cases in the third year, 31 in the fourth, and from 14 to 30 each year, until the tenth year. From this period the number gradually decreased until the seventeenth year.

In Snyder's cases the question of age is rather interesting. There was 1 case at two months; 1 at four months; 1 at five and 1 at six months; 2 in the second year; 7 at two years, and 5 at three years of age. According to his estimate 10 per cent. of all pellagrins are children under fifteen years of age.

The writer has only seen 2 in the first twelve months of life. A striking fact might be mentioned here—the simultaneous occurrence of pellagra in mother and nursing child is extremely

rare. There may be intestinal disturbance and often cases of malnutrition however in nursing infants of pelagrous mothers.

As to sex, among early cases, the difference is not great. There is a slightly higher rate among females in the earlier years, with a marked increase in the incidence rate in males after ten years of age.

In this country there is apparently quite a contrast between the white and the colored race. The ratio is in some instances as high as 25 to 1. In a section where the proportion of whites to negroes was 2 to 1, the cases stood 10 to 1.

Of all the data collected there is nothing to show any predisposition to direct heredity. There may be a possible hereditary disposition in those families in which chronic gastrointestinal symptoms have existed for several generations. Of 105 families in which only 1 case occurred, there were 3 who gave a history of intestinal or skin disease in ancestors.

It was at first thought the disease was confined largely to the warmer climates, but recent investigations have shown that it is limited to no climate. Again, it was thought to be prevalent only in the spring and summer. Closer observation has shown that it frequently occurs in the winter months. The skin lesions are more marked at the times of greater sunlight. Direct sunlight does aggravate the intensity of the rash, while the cases protected from the sun show less marked skin symptoms. They are said to be less prominent at times of high precipitation of moisture.

Mason of Birmingham, who reports 20 cases, says the children were well nourished, seemed not to feel badly and complained very little. Diarrhea and nervous symptoms were not pronounced. In contrast to this is given a typical severe case in a child:

Patient admitted to hospital in May.\* There had appeared in February, two small red symmetrical areas at the outer canthi of the eyes. These areas extended over the forehead. The eruption next appeared beneath the angles of the jaws and from there extended around the neck, meeting behind. Soon after the appearance of the skin lesions there developed a severe stomatitis. The next step in the disease was the appearance of the erythema on the backs of the hands including the fingers. From the beginning there was always an obstinate diarrhea. The case came under observation in May.

\* Dr. W. J. H. Bellamy's case.

*Physical Examination*—The face was covered with a lesion appearing like an old burn and had caused much contraction, producing an ectropion of both lower lids and distorting the mouth. The patient was unable to open her mouth wide enough to permit any examination; she was also unable to close her eyes completely. Both hands and lower thirds of the forearms were covered anteriorly and posteriorly with the "moist" lesion.

*Courses of Disease*—Conjunctivitis soon developed and there was marked subconjunctival edema. The feet were oedematous and several weeks later the lesion appeared on the dorsal surfaces. The knee jerks were absent; skin sensation normal. The pupils reacted normally to light and accommodation. The patient complained constantly of cold. Her appetite was at first good, but later she refused all nourishment. The affected skin was exfoliated, leaving perfectly raw surfaces. She died of exhaustion in June.

There are usually prodromal symptoms in those old enough to give an account of their condition, that often occur in the early spring, preceding the acute attack. There are indefinite symptoms such as anorexia, or voracious appetite; pain and a sense of distension in the epigastric region; frequently diarrhea, though often constipation, with insatiable thirst. Often there are headaches, chiefly occipital, pain in the back and neck; dizziness, muscular weakness and a burning sensation in the bottom of the feet. Theodori has asserted that these prodromal symptoms exist for weeks before the appearance of the erythema.

Children with the disease do not differ markedly from adults, except, as a rule, the course is milder. Marked nervous symptoms are not common, and frequently do not appear at all. Not uncommonly the eruption may be the only prominent symptom.

The erythema usually begins at the extremities of the fingers posteriorly and extends to about the juncture of the middle and lower third of the forearm. In general appearance it is usually that of "diffuse redness without swelling." It is very distinctive though it is often mistaken for sunburn. The lines of demarcation are symmetrical in position and usually in direction between normal and diseased skin. The condition ends in a branlike exfoliation, or there may be blebs which rupture, leaving raw surfaces that soon became covered with crusts. The appearance of the skin after healing is variable. It may be soft and velvety but there is always a tendency to loss of pigment which is more



evident with each recurrence of the erythema. Occasionally the lesion extends to the palmar surfaces of the hands. After the hands, the face is most apt to be affected, usually beginning at the outer canthi of the eyes, or angles of the mouth. There may be symmetrical areas on the forehead, with normal skin in the mid-line. Often the lesion assumes the butterfly shape of lupus, especially on back of the neck. Small areas below the lids are frequent. There have been seen lesions on the back of the neck, with a maintenance of the same symmetry. They may extend laterally to form a collar meeting in front. The next point of selection is the dorsum of the feet, beginning over the crest of the tibia and extending downward to the toes. It may also occur over the labia pudenda—a frequent site of the lesions in children—and the sternum. With the healing there is associated contraction of the skin as in superficial burns.

Stomatitis usually follows the skin lesion, though sometimes appear before it, and again may be entirely absent. It is usually quite characteristic. There is a suggestion of salivation, which in fact is often present. The gums are swollen and intensely red. The tongue is of a bright red and often denuded of epithelia (bald tongue), with papilla enlarged. The child complains of a salty taste and burning in the mouth. The mucous membranes of the vagina are often affected—red in appearance—and there is a vaginal discharge—often an early sign.

One of the most unfailing of the early symptoms is obstinate diarrhea, frequently associated with a violent colic. The patient complains of a burning sensation in the abdomen, a numbness with coldness of extremities. Vertigo is quite marked and a condition somewhat resembling tetany has been noted, with paroxysmal tonic contractions.

Pellagra is usually described as a feverless disease, but observations have shown that during the very active stage, the temperature ranges from 95.5° to 102°. The urine is alkaline and shows a decided reaction for indican. When the cases are toxic there is often found albuminuria, if the patient survives the onset.

The patient who survives the first attack is liable to a recurrence within the succeeding twelve months or two years. About 50 per cent. have such a recurrence. A year without a recurrence is considered favorable. When subsequent recurrences do occur they are less likely to end in death. Recurrence after several



years of freedom from pellagra is not uncommon. Cases in children with yearly recurrences for eight years have been reported. One such case eventually died with the eighth recurrence. The usual course of those who do not recover is one characterized by general atrophy of the body, in which subcutaneous fat disappears and the child presents the picture of advance cachexia with profound weakness. There is often a paralysis of the bladder and nearly always incontrollable diarrhea.

Death is usually attributable to a myocardial degeneration. In many chronic cases there is often an acute terminal exacerbation, and it is this which is usually referred to as "typhoid pellagra." It is also true that children in this stage very often die of bronchial pneumonia and there is a question whether the temperature in this "typhoid state" may not be that of the associated pneumonia.

The danger to life in the recurrence is not very different from the danger in the initial attack and may be less. The death rate in recurrence is about 12 per cent. The prognosis would seem more favorable for recovery from the attack but less favorable to escape from recurrence in the next year—in cases in the later years of the disease. In other words it tends to become established as a chronic disease with annual manifestations. It is impossible to say when a patient has definitely recovered. In those who escape recurrence for a year or more, it is best to consider the disease as arrested or inactive.

In regard to the so-called pellagra-sine-pellagra (without skin manifestations), there is some contention. Some authorities consider the skin condition essential to diagnosis. There is a form of the disease however in which the skin lesion does not occur. These cases show some of the nervous manifestations with repeated attacks of stomatitis with diarrhea, with emaciation and obstinate gastrointestinal disturbance.

A number of these cases so diagnosed prove to be sprue, a tropical disease of growing importance to Southern physicians. Wood, of North Carolina, has investigated this condition and reported on it. Fortunately for us sprue is rather rare in the United States, though common in Porto Rico. He gives the differential diagnosis:

Cardinal symptoms of sprue are stomatitis, a peculiar diarrhea, diminution in size of the liver, a secondary anemia with wasting. There are neither skin nor nervous manifestations.

In pellagra with skin and nervous manifestations in abeyance the reduction in size of liver, anemia and wasting are common to both.

One important difference in them is to be found in the character of the diarrhea and more especially in the stool itself. In sprue, the diarrhea usually occurs in the early hours of the day. The stool is voluminous, light in color, acid in reaction and of a foamy gaseous character. In pellagra these characteristics are not observed. The chemical state of the stool seems to be highly important in the differentiation. The large size of the sprue stool is due to lack of digestion and absorption of certain bodies, notably fats. Fatty stools with great fat and nitrogen loss are said to be characteristic of sprue, while in pellagra the fat and nitrogen of salts are about normal. Indicanuria is present in both conditions. It is present in pellagrins in 96 per cent. of cases tested. Sprue does not always appear in its typical form. There are "incomplete cases" with diarrhea alone and of tongue sprue when only the mouth signs occur. It is certainly true that in territory in which the disease is unknown or unrecognized an attempt to diagnose cases without the appearance of erythema is open to criticism.

Given a child with a red tongue, fissured lips and diarrhea, together with such nervous symptoms as headache, insomnia, restlessness, paraesthesia and over-active or absent knee jerks, or the more advanced symptoms with spasms, rigidity and photophobia the question of pellagra should be seriously considered. Some authorities are inclined to lay great stress in diagnosis on the muscular weakness of the lower extremities. Not infrequently while the question of diagnosis is under discussion, there may develop an erythema, quite slight or transient, on the dorsum of the feet, hands and on the knuckles, lips or in the angle of the thumb and index finger and over the patellar, which may serve to confirm the diagnosis though this is absent in a number of cases, or the observance of it on account of its transiency is not noted.

*Prognosis*.—Is good in most cases. Permanent recovery at home without special treatment is fortunately the rule, in a majority of instances. It has been noted that the cases in children occurring in the years 1906 and 1909 were far more virulent in their course than those observed in the last two years. The prognosis in a very young child is unfavorable in proportion to his youth. Certainly pellagrous infants with actively pellagrous

mothers stand very little chance. Children from the ages of four appear to run a milder course and under change of surroundings improve, and with improved dietary they usually recover. They should be kept under observation for several years, however, as the recurrence is still a question. Though it is claimed that with corrected diet, it will not occur. The number of recurrences was lowered in the Epworth and Thornwell orphanage epidemics in South Carolina by improved hygienic conditions and change of diet. Those suffering from the second or third attack usually improve, but more slowly and those in the fourth attack improve even less rapidly.

*Pathology*—Wood reports a case of definite degeneration of the posterior columns of the cord in a child sixteen years of age who died with pellagra. The child had all the symptoms of a transverse myelitis. The number of autopsy reports available on children is very few, but the characteristic appearance in the advanced cases in adults is that of a central neuritis.

*Blood examination*—Complement fixation tests are negative; there is a mild degree of secondary anemia.

*Summary*—The number of cases in children is 10 per cent. of the whole. The virulence of pellagra in children is apparently decreasing.

In diagnosis it is essential to consider sprue as a factor.

It is not hereditary or transmissible from mother to nursing infant.

Treatment is limited, though, Goldberger says recently: "I have found it is absolutely preventable by an appropriate diet."

The writer is indebted to Dr. E. J. Wood, of Wilmington, N. C., for numerous personal instances of the disease among the children in his practice.

Dr. Joseph Goldberger, of the United States Public Health, has kindly given information at his disposal.

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EXCRETION OF CREATININ AND OF CREATIN IN ACUTE NEPHRITIS—I. S. Cutter and M. Morse (American Journal Diseases of Children, 1916, Vol. XI., p. 326) present the data derived from a study of 2 children aged five and thirteen, whose cases were followed for periods of thirty-five days and ten days, respectively. The diets in each case were practically creatin and creatinin-free, being administered for minimum protein maintenance, calculated in calories. In 1 case the temperature was practically normal except at the beginning of the disease. In the other the chart was not available. The most conspicuous feature of the curves of excretion of both constituents and in both cases is the wide variation from day to day. Moreover, this variation, which approaches a rhythm, is independent of all known concomitant factors, such as food, temperature, etc. It appears that a threshold exists which, on being reached, leads to excretion of the creatin and creatinin. Retention in the sense of almost if not quite total suppression of excretion of these components does not exist for a period of more than twenty-four hours. The curves exhibit no correlation between the behavior of creatinin and that of creatin. It is impossible to determine anything which might suggest an origin of one from the other. There is a wide divergence between the data reported for adults and those determined by the writers for children.—*The American Journal of Obstetrics*.



# ANALYSIS OF THE PREPARALYTIC SYMPTOMS OF INFANTILE PARALYSIS

BY JOHN A. COLLIVER, A.B., M.D.  
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Prophylaxis is the most important consideration in infantile paralysis. Cure is next. Treatment is more effective the earlier the diagnosis. In practically every case of poliomyelitis the diagnosis has been made after paralysis occurred. In other words, when all the possible damage is done. From this time on improvement is naturally more or less progressive if too much interference treatment is not used. Thus, if it is possible to detect the disease in the preparalytic stage we have the greatest opportunity for efficient treatment. It is with this end mainly in view that I am submitting the following table, showing the analysis of symptoms of 16 cases in the preparalytic stage:

It is impossible to bring out everything in this table. In reviewing it and comparing its parts with the case histories the following summary seemed most significant.

*First Symptoms Observed*—It will be noted that the first symptoms observed in all cases were changes in the disposition, or a disinclination to play. The former is exhibited as irritability. It may be in the form of crying at night, with grinding of teeth and starting in the sleep, or crying spells without apparent cause during the day. The indisposition to play is shown by the fact that the child plays less and lies around more. He is cross, peevish and dissatisfied generally.

A little later, or perhaps at the same time, it was observed that practically all cases had more or less fever, anorexia, with some unaccountable vomiting, present alone or with constipation or diarrhea. Three had diarrhea and two were decidedly constipated. In the majority of these cases the bowels were loose with a tendency to tympanites. In only 3 cases was vomiting the first symptom noticed. The temperature in the spinal cases was higher and earlier noticed than in any of the others.

The above symptoms might be characteristic of an intestinal indigestion or the onset of any of the childhood infectious diseases.

Lack of coördination, another early symptom, easily overlooked, is manifested by the inability to hold things in the hand, falling easily, knocking things over at the table. Spilling milk

CASE	AGE	SEX	FIRST SYMPTOM NOTICED	GASTROINTESTINAL AND CONSTITUTIONAL	NERVOUS	NEW SYMPTOM WITH LOCATION AND THE TIME NOTICED BEFORE PARALYSIS	REMARKS AND LOCATION OF SUBSEQUENT PARALYSIS
1.	10 yrs.	M.	Indisposition to play Cross Irritable	Bowels loose "Warm medicine" day before and headache	Irritability Hypersensitive Sweating Pain in legs	Numerous short, jerky convulsive spells of limbs, more especially hands with fingers in extension. Few seconds' duration. Every fifteen minutes to two hours, depending upon amount of disturbance. Least disturbance of bedding would often cause spells. Two days.	Arms and legs
2.	10 mos.	F.	Restlessness Sudden Onset Crying at night	Diarrhea Fever, 102°	Hypersensitive	Quivering and jerking in sleep. Few seconds' duration over body. Same symptoms when disturbed. One day.	Both legs
3.	27 mos.	F.	Inability to hold orange in hand	Vomiting Cutting teeth Prostrated High fever, 104°	Extreme irritability Hypersensitive Sweating on head and neck Stiff neck	Convulsive movement of few seconds' duration, affecting hands and arms, alternating with face and legs, especially left fingers separated and quivering with wrist flexed. Somewhat stupid between spells. Two days.	Third day left side face, arms and leg Recovery. Had to learn to walk again
4.	4 yrs.	M.	Drowsiness	Vomiting Temp. 102° and 103° Headache	Extreme hypersensitivity Pain in legs Sweating on chest and head Could hold up right leg - after knee reflex lost	Series of convulsive spells lasting few seconds. Hands and arms quivering. Fingers separated and extended, followed by stupor and sweating. One and one-half days.	Right leg. Right muscles of back
5.	6 yrs.	M.	Indisposition to play	Intestinal indigestion Some fever 101°-102° Offensive stools Tympany	Hypersensitive Sweating on head and neck Semi-comatose	Slight convulsion, preceded several hours by numerous short twitching, localized jerky spells. Mostly lower extremities. Twelve to fourteen hours.	Right side face, arms and legs Lumbar puncture 20 c.c. Lumbar clear; 175 mm. Died fourth day
6.	6 yrs.	M.	Extreme irritability	Constipation High Temp., 102°-105°	Hypersensitiveness Sweating of hands and neck Slight stiffness of neck Pain in legs and neck	History of several shaking spells similar to chill all over body lasting few seconds. One and one-half days.	Right arm and shoulder at muscles of upper back
7.	2½ yrs.	F.	Vomiting Diarrhea Thought due to ¼ raw turnip taken day before	Diarrhea Vomiting High Temp., 102°-104°	Extremely irritable Hypersensitiveness Pain in legs Active reflexes Later loss in abdomen and knee	Numerous quick convulsive quivery movements, few seconds' duration, confined mostly to legs, at times the entire body with feet extended, right great toe flexed. Shiver or jerk in an irregular manner. This symptom always produced on slight irritability of skin. Three days.	Both legs
8.	7 yrs.	F.	Extreme irritability Vomiting	Vomiting Constipation dis-tended High Temp., 102°-105°	Hypersensitive Pain in legs Stiff neck	On second day numerous short convulsive twitching movements affect chiefly legs. One day.	Both legs
9.	8 mos.	F.	Irritability Crying at night	Vomiting Green, offensive stools Cutting incisors	Extreme irritability Sleeping, eyes part open Sweating on head and neck. Semi-comatose Labored respiration	Several short, rigid, convulsive, tremorous spells, affecting extremities, arms and fingers. Other times attacks of few seconds or less, with eyes set, face muscles slightly twitching and apparently unconscious. Two and one-half days.	Right facial
10.	4 yrs.	M.	Hands shook so could scarcely drink Extreme hyperacousis	Constipation Anorexia Some fever, 101°-102°	Marked hyperacousis Hypersensitiveness Some pain in head and back of neck. Later swallows with difficulty. Coughs Sweating in hair and forehead Slight Romberg	Numerous, spells lasting few seconds. Sudden jumping to sitting position in bed. Arms extended, hands quivering, then quiet. Short tremorous spells, produced by noise, lasting mostly confined to lips and chin; sometimes arms, lasting only few seconds. One day.	Right side face, neck and tongue Loss of voice

11. 5 yrs.	F.	Restlessness Crying at night	Tympany Intestinal ggestion Fever, 101°. Prostration	Extremely irritable Later semi-comatose Sweating Throat filled with secretion 105°	Numerous short, jerky convulsive spells, affecting chiefly arms. When awake same produced by least irritation of skin and moving in bed. Spells lasted few seconds, followed by sweating. Three days.	Right side face Pharyngeal Lumbar puncture 25 c.c. clear; 180 mm. Byturic acid test positive
12. 7 yrs.	M.	Difficulty in swallowing Later vomiting	Loose bowels Vomiting Some temperature, 101° Malaise Face flushed	Restless night Extremely nervous Hyperacousis Difficulty in swallowing Neck sometimes stiff Later voice thick	Several short spells of twitching of hands at least, noise; quivering of chin and lips. When moving in bed, jerky movement, with arms extended, fingers separated and quivering, lasting for few seconds. Other times these spells accompanied by set eyes and quivering chin. Three days.	Right facial Loss of voice
13. 3½ mos.	M.	Vomiting	Offensive stools Pale Temp., 103° Extreme prostration	Hypersensitiveness Screamed when leg was touched Retraction of head Pain in legs Right knee-jerk exaggerated	Few short, tremorous or quivery spells of chin and lips. None of limbs. Not produced by cutaneous irritation. Eight or ten hours.	No paralysis Abortive
14. 16 mos.	M.	Irritability two or three weeks Extreme during last day or so	Vomiting Anorexia Offensive, green stools Gums swollen, bled some under tongue Ulcer under Some fever Acts very sick Cries great deal	Extremely irritable Hypersensitive, especially of legs. Cries when legs are touched Head retracted No neck rigidity Complete loss of use of legs last day or so.	None.	Scurvy
15. 6 yrs.	F.	Vomiting Tonsillitis	Constipation Headache Fever	Irritability Extreme hypersensitive-ness Tenderness of limbs	History of several convulsive attacks lasting only a short time. When disturbed, some indication of the above. Two days.	Abortive
16. 14 mos.	M.	Pneumonia ten days before last symptom	Abdomen flat Stools greenish-yellow Gagged numerous times, but no vomiting Extreme prostration Temp., 101°. 104° 12th day Temp. and Resp. normal	Extreme hypsensitive-ness Slight lateral nystagmus Internal strabismus Semi-comatose Later unconscious	Numerous short tremorous convulsions. Few seconds to several seconds' duration. Arms stiff, fingers separated and quivering, with thumb drawn back, wrist flexed. Similar convulsive movements of low extremities. Spells at times accompanied by peculiar cry. Spell produced by handling. Also twitching or tremorous spells of chin, with eyes fixed, lasting few seconds. Two or three days.	Loss of eyesight, sixth day Loss of hearing, seventh day Right eyelid Right side face, arm and leg Lumbar puncture clear Noguchi byturic acid test positive Recovery
17. 2½ yrs.	M.	Extreme irritability Crying spells Slight pharyngitis	Refused food Temp. normal at first, then 101°-104° Prostration Flushed cheek High up	Extreme hypersensitive-ness Exaggerated reflexes Sweating on head and neck Later comatose Neck stiff	Series of short convulsive spells, affecting whole body, at first chiefly head and arms; peculiar cry at same time. Child became more hypersensitive. Touching produced spells affecting arms and legs. Arms usually extended, fingers extended and separated, with wrist flexed and one finger flexed. Same true of legs and toes. At times face and lips quivering and tongue running in and out. Unconscious spells for few seconds. Eyes fixed. Face quivering. 300 separate observations of this symptom were recorded before paralysis appeared. The spells were only a second to few seconds in duration and thirty minutes to two hours apart, depending upon amount child was disturbed; later the spells were longer, lasting one time a minute and occurring every three to fifteen minutes. Two and one-half days.	Loss of sense of sight and hearing Paralysis right side face and limbs Recovery. Had to learn to walk and talk again Lumbar puncture 20 c.c. clear; 210 mm.

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or water in the attempt to drink from the cup, etc. In one case the first thing to attract the anxiety of the parents was the inability of the child to hold an orange in the hand. In another, inability to drink from the cup, and in still another, the first symptom the child exhibited, was inability to rise after having fallen in the tub when taking a bath.

The nervous symptoms noted are those characteristic of meningitis. The irritability progresses to hypersensitiveness, usually followed by drowsiness. The reflexes were at first more active, the skin was extremely hypersensitive, and there was sweating in practically every case. There was also evidence of pain in over half of the cases. Other observers find this symptom more common, but I think it is usually exaggerated by the extreme hypersensitiveness of the skin in younger patients, and in older children by suggestion of the parents.

*Posterior Horns Early Affected*—For many years diagnosis of infantile paralysis was made only when paralysis appeared, thus showing the involvement of the anterior horns, hence "anterior poliomyelitis." As an indication that the posterior horns are first involved we have as a most constant symptom of the preparalytic stage the extreme hypersensitiveness of the skin. This hypersensitiveness at times is so marked as to be painful, that is, causing the child to cry when the skin is touched. Older children complain of pain. This sensitiveness often extends to the period after paralysis sets in, so that a child may cry when a limb is touched, yet be unable to move it.

In the bulbar or bulbospinal cases sudden noise will produce a tremor or convulsive movement usually confined to the face or some part thereof. Another evidence is the early exaggerated reflexes, and the presence of Romberg's sign, as noted in 2 cases.

As further evidence that the posterior horns are early infected we have the tremulous condition which I first described in the *American Medical Journal*, March, 1913. It is brought out in the table and it consists of a peculiar twitching, tremulous, convulsive movement of certain groups of muscles, lasting for a fraction of a second to a minute or more, and seems absolutely characteristic of the preparalytic stage. It is elicited by stroking the skin with the finger, by movement of the bed clothes over the sensitive skin, or by an effort of the patient to coördinate. In either of these cases the result is this peculiar tremor which may affect any part or all of the body. This is present from twelve hours to three days before paralysis occurs.



It is also a very important observation that the intensity, duration and frequency of this symptom increase as the case nears the point of paralysis.

The organism seems to be in a tension with the nerve cells highly stimulated or irritated by the toxin similar to that found in strychnin poisoning, so that the least external stimulation, such as touching the skin, noises, etc., is followed by a series of minute local or general convulsive movements. This is explained by the early presence of toxin in the spinal fluid, the increased spinal pressure, and the lack of coördination due to the escape of some nerve fibers, whose origin is from more than one segment of the cord, while the toxic blood supply is horizontal to single segments.

*Hyperacusis in Bulbar Cases*—In the bulbar type, represented by Cases Nos. 9, 10 and 12, it is interesting to note that there was no Kernig, no Macewen and that all possessed marked hyperacusis. In bulbospinal cases, Nos. 3, 5, 11, 16 and 17, the hyperacusis was not so marked, or entirely absent, while in the spinal cases it was not present at all.

CASE NO. 9. Hypersensitiveness in this case was so marked that the least sound would cause the child to have tremulous spells all over the body, and especially the muscles of the face, accompanied by a peculiar cry with eyes staring in unconsciousness similar to a *petit mal*. In addition to having a right facial paralysis, the child was unable to see or hear for twenty-four hours before death, the latter due no doubt to respiratory paralysis.

CASE NO. 10. The least sudden noise caused the child to jump and start with quivering and tremor confined chiefly to lips and chin, giving the appearance of a child about to cry. This child exhibited a marked Romberg. The tongue protruded and curved slightly to the left. When attempting to swallow water the child coughed, and the water came out through the nose. Later swallowing became difficult, but without coughing, the water continued to come from the nose. Articulation was at first thick, and later lost entirely.

CASE NO. 12. The least noise produced starting, *petit mal* spells, accompanied by backward and forward quivering of chin. The tongue protruded straight; child could not cough; water did not come out of nose; articulation thick, almost nasal; and skin extremely hypersensitive. The child always jumped with a start when touched.

CASE No. 16. Noise produced tremor, confined many times to the face and especially tongue and lips. In this case there was complete temporary loss of sight and hearing; child was compelled to learn to talk again.

Exaggerated knee-jerks were present in practically all cases of the spinal or bulbospinal variety in the preparalytic stage. Kernig was always present in the spinal cases.

Tache cérébrale seemed more marked in the spinal cases than in any other type. It was very pronounced in Cases 1, 2, 6, 7 and 8.

Only 1 child-spinal case, No. 8, had a distinct convulsion. This same case was the only one exhibiting the hemorrhagic eruption.

Macewen's sign was more noticeable in the spinal or bulbospinal cases, most marked in Cases 5, 9, 11, and entirely absent in all bulbar cases.

Sweating was noticed in 9 cases, in 6 of which it was localized on head and neck, and in one on hands; 5 were not mentioned, whether present or not, 3 not present at all, and 2 of these were abortive.

In Cases 16 and 17 it is noted that the child yawned a great deal. Case 16 was preceded ten days by pneumonia, from which the child recovered. Case 17 was preceded by pharyngitis and tonsillitis, from which it had partially recovered. Case 5 was preceded by intestinal indigestion for two weeks. Case 9 showed intestinal indigestion one week previous to attack.

I believe that the preparalytic symptoms of infantile paralysis will be better understood and treatment more efficient when the coöperation of the public is obtained. To do this during an epidemic they should be instructed to report every case in which there is a change in the disposition of the child. Then under careful observation and painstaking examination more light will be thrown upon the symptoms of the very beginning of the disease.

It seems very evident to me that the posterior horns are early involved, and that if any lesson can be derived from this table it is that absolute quietude, freedom from noise and all physical disturbances should be inaugurated in the very early stage. This will give the patient more comfort, and I believe will prevent the extension of the trouble.

## CARDIAC DISEASE IN CHILDREN AND THE CARDIAC CLINIC

BY J. S. FERGUSON, M.D.

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In late years the statistics of the Health Department of New York have shown cardiovascular diseases to be increasingly prevalent. As a cause of mortality they have relatively increased quite as rapidly as tuberculosis has decreased, until the deaths from cardiac disease and apoplexy now exceed those from tuberculosis.

The reduction accomplished in the mortality from tuberculosis has been obtained by removing, so far as possible, the sources of infection. Likewise a similar campaign against cardiac disease would attack the plague at its sources. Thanks to the developments of the last decade, the importance of "focal infections," as related to cardiovascular disease, is beginning to receive deserved recognition and a means of prevention for at least a portion of the prevalent valvular disease has been brought to light.

In further attacking the problem a survey of the age distribution of the disease furnishes valuable suggestions. The relative frequency of cardiac disease in childhood is a matter of common knowledge. The writer was astonished by the relatively low ratio of cases announced for school children in 1913\* and its lack of agreement with everyday experience in the out-patient clinics, where a very considerable proportion of patients invariably presents cardiac lesions.

Believing that the conditions under which the school examinations were necessarily made were not such as to disclose the true state of affairs, I suggested to the Social Service Department of Bellevue Hospital that a survey of neighborhood children be made. With the coöperation of the Department of Education this was later accomplished (summer of 1915) under the direction of Dr. H. V. Guile, and disclosed the fact that roughly 7 per cent.† of a large group of nearby school children were affected with

\* 1,345,398 school children examined between 1909 and 1913 showed 9,687 cases, less than 1 per cent., in which cardiac disease was found (New York Health Department, Bureau of Child Hygiene).

† Two per cent. of these were classed as "functional murmurs."



organic or functional cardiac murmurs. One out of every 15 children was found to have a crippled heart! If one compares this with the percentage of the crippled or deformed in the schools, the enormous relative size of the "lame heart group" becomes at once appalling.

Owing to the comparative infrequency of death from cardiac disease in children, the medical profession has been inclined to treat with neglectful disregard the cardiac problems of childhood. Statistics of the United States Registration area for 1912 show that of 486,179 deaths from organic heart disease 1,826, or 2.1 per cent., occurred under the age of ten years, a small yet formidable figure.

But, while only 2 per cent. die under ten years, 5 to 7 per cent., as shown by Guile's results, are affected by the disease; the remaining 3 to 5 per cent. live on into subsequent decades to form an ever-increasing increment of adult cases. This is an important aspect of the case which should not escape recognition.

Were an internist, unfamiliar with pediatric practice, to turn his attention to heart disease in children he would certainly be struck with the large proportion of cardiac murmurs which, if observed for a few months, finally disappear. Some of these are to be obviously classed as "functional," though many of them represent a mild attack of acute endocarditis terminating in recovery. Many of the murmurs are indistinguishable from true organic disease and they persist for years, frequently from childhood into adult life.

There are thus disclosed two prominent and important facts regarding the problem of cardiac disease in childhood—the considerable proportion of cases which pass on to adult life with crippled hearts, and the frequency with which acute cardiac disease ("functional murmurs") is recovered from in children.

With the idea of instituting a preliminary study of these facts and ascertaining what might be accomplished in a small way with the coöperation of the Social Service Department, a group of cardiac children was organized in connection with my clinic at Bellevue Hospital late in 1913. It has since been continued, and in October, 1916, was merged into the larger cardiac group in the clinic now under the direction of Dr. Charles H. Smith. During the past three years, though assistance has been insufficient for detailed study, certain significant cases have been observed. Two are of special interest.



S. B., age twelve, a large overgrown girl of robust appearance, applied for treatment for vertigo and dyspnea. Examination revealed a loud aortic diastolic murmur, hypertrophy and beginning decompensation. It was found that she lived on the "top floor" (four flights) also that she attended school regularly on the fourth floor of the school building. She travelled up and down the stairs of the school in the regular routine of attendance, fire drill, gymnasium, etc., some six or eight times daily.

The family was readily induced to remove to a lower floor; some simple rules of hygiene and exercise were given and improvement ultimately followed. An effort was made to secure for the patient instruction in a schoolroom located on a lower floor of the school building. It was impossible! Each succeeding grade was inexorably moved up one flight till the roof was reached, when graduation followed in natural sequence.

After many conferences by the social service worker with principals and superintendents, after addressing communications to the departments of health and of education, after soliciting for the general welfare of cardiac children, the coöperation of the Public Health Committee of the Academy of Medicine, and of others, the utmost that could be accomplished for this pupil was the privilege of repeating a grade on a lower floor or travelling some distance to a neighboring district, where her grade happened to be located on the third instead of the fourth floor. The latter alternative was selected as the less of two evils. We establish open-air classes for the anemic and the tubercular, we send carriages for the crippled and automobiles for the poliomyelitic—when, when will we learn to admit the crippled heart to the same privileges as the crippled legs?

There are less than 5,000 crippled legs in New York City as a result of the recent appalling epidemic of poliomyelitis among our children, and we are doing much to alleviate their suffering; there are more than 25,000 crippled hearts (Holt) among the school children of New York, and we are offering them little or no assistance to facilitate their recovery.

Why should the dyspneic be required to daily climb four flights to school while the paralytic and the anemic travel in automobiles and are segregated in open-air, ground-floor classes?

The prevalence of dental caries and even of pyorrhea alveolaris in cardiac children is noteworthy, and when the defect is

apparently absent from the case itself it is frequently present in the members of the immediate family. Such foci furnish the nidus from which germs may spread from mouth to mouth, from tooth to tonsil, and from the oral cavity gain ingress to the vascular system.

Three children of the same family were brought to my clinic at Bellevue; two had valvular heart disease, one with a normal mouth and the other with only trivial dental caries. The third child had a normal heart but extensive pyorrhea alveolaris. The mother likewise had pyorrhea. The combination suggests a probable source of infection.

Scherer and Kutvirt (Jahrb. f. Kinderhk., August, 1915) in 4,450 infants under observation found 4.87 per cent. of middle-ear trouble.

The great frequency of latent "focal" tonsillar abscess has been emphasized by Rosenow, Billings and their followers.

Richards has demonstrated the streptococcus viridans in the blood of more than 60 cases of chorea.

It is high time that we came to regard all endocarditis, as we have long regarded ulcerative endocarditis, as an infection, arising from a local source. A possible source can usually be found in or about the mouth cavity and its adjacent sinuses, though purulent processes elsewhere in the body, as well as in the infectious diseases of children and adults, may occasionally be convicted. Various members of the pus group of bacteria are probably the aggressors, most frequently those of relatively low virulence as regards mortality.

It may be well enough to speak of tonsillitis, arthritis, endocarditis and chorea as rheumatic affections, but not unless we clearly recognize rheumatism as the expression of infection, the bacteria entering the blood stream from purulent foci in the mouth, tonsils, ears or elsewhere, and lodging, as the case may be, in joint, endocardium or central nervous system.

By competent recognition of the possible sources of cardiac disease, by carefully following up cases at their homes, by studying the epidemiology as it were, the cardiac clinic with an effective social service can do much for the prevention of heart disease in children. By such prevention a fertile source of adult morbidity and mortality will be avoided.

Moreover, by attention to intercurrent diseases, by careful instruction in hygiene initiated by the physician and followed up by the visiting nurse, by coöperation with open-air clinics and fresh-air homes, by the admission of cardiac children to open-air classes or to those on the ground floor of our schools, much can also be accomplished for the cure of endocarditis in the acute and subacute stages so frequently occurring in childhood, and thus a further reduction of morbidity and mortality be secured not only for the child, but for the adult as well.

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SCARLET FEVER, MORBIDITY AND FATALITY—A statistical study by H. H. Donnally (*American Journal Diseases of Children*, 1916, Vol. XII., p. 205) of figures obtained from several million board of health notifications of cases and deaths from scarlet fever supports the following conclusions: Periodicity in the appearance of epidemics of scarlet fever cannot be made out. Morbidity and mortality rates for scarlet fever seem independent of each other. A decline in morbidity has not generally been made out. Where notification has been of longest duration and most thorough (Norway) a reduction in the incidence of scarlet fever has been observed. Season itself does not influence morbidity. The sexes as a whole show equal susceptibility. Under five years of age boys are more susceptible, while between five and fifteen years of age girls are more susceptible than boys. About half of the cases occur in children between three and eight years, and 90 per cent. in those under fifteen years of age. About 2 children out of 3 between three and eight years of age contract scarlet fever if exposed to it in their homes, if they have not previously had it. Different epidemics may vary greatly in virulence. Scarlet fever has been regularly more prevalent in some places than in others. It has been consistently attended by greater fatality in some places than in others. At all ages males succumb more readily to it than females. Case fatality is lowest in those about ten to fifteen years of age. The younger the child, the less is his chance of recovery. About 90 per cent. of deaths from scarlet fever occur in those under ten years of age.—*The American Journal of Obstetrics.*

# PERLÈCHE: ITS BACTERIOLOGY, SYMPTOMS AND TREATMENT IN TWO HUNDRED AND TWENTY-THREE CASES \*

BY ARTHUR L. SMITH, A.B., M.D.

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Perlèche is an infection of the labial commissures, manifesting itself, first by a maceration of the epithelium, secondly by a desquamation of this tissue, and thirdly by a formation of shallow ulcers and cracks. It is undoubtedly contagious and is essentially a disease of childhood, 93 per cent. of the cases reported in this paper being in children. Of the 1,211 children I have examined in our dispensaries during the last three years, 207 were infected with perlèche in some stage of its development. It was found sixteen times in adults, and of this number seven were dispensary assistants who were intimately in contact with the disease. These patients were seen in the Brookside Kindergarten Dispensary, the Hunter Settlement Children's Dispensary, and the Children's Dispensary at the Lincoln Memorial Hospital in Knoxville, Tenn., during the past three years.

The etiology of perlèche has been the subject of a great deal of controversy. Lemaistre<sup>1</sup> believes an anaerobic streptococcus is the exciting organism, while Raymond,<sup>2</sup> Planché<sup>3</sup> and others,<sup>4</sup> having isolated the staphylococcus pyogenes aureus and albus from the lesions, assign these bacteria as the active cause. In my series of 223 cases I have isolated the anaerobic streptococcus, in pure culture, in 135 cases. This was early in the course of the disease; that is, from the time of the maceration to shortly after the desquamation of the epithelium. Twenty-six times the same organism was found in combination with the staphylococcus pyogenes aureus; seven times with the staphylococcus albus, and fourteen times in association with the streptococcus pyogenes. In the later stages of the disease, the anaerobic streptococcus was not found at all, but the staphylococcus pyogenes aureus was found alone thirty-six times and was associated three times with the streptococcus hemolyticus. Thus, it seems, the anaerobic streptococcus disappears after the secondary infection, for the cultures taken in the early days of the disease

\* Read before the Lincoln Academy of Medical Science, March 15, 1917.



have, without exception, yielded the anaerobic streptococcus, while after the formation of the ulcer the staphylococcus has been the predominating organism.

The cultures were always taken from the lesions in the fissures at the angles of the mouth. The surface of this area was first thoroughly dried with sterile gauze and the superficial epithelium was scraped away, then the serum which exuded was transferred to the culture tubes. Six times I have inoculated the corners of my own mouth with the anaerobic streptococcus and in each case the characteristic lesions appeared within seventy-two hours and the organism inoculated was isolated each time. The technique employed and the reaction of the organism to the different laboratory media will be fully reported, in a later paper, when this work is completed.

The ages of the children infected varied, the youngest being six months of age and the oldest had reached her fourteenth year. In dispensary patients, it appears in the well-developed as often as in the under-nourished. All live in ill-ventilated houses with unsanitary surroundings. Perlèche is more prevalent during the colder months, 73 per cent. of these cases having appeared during the winter season. It seems to be secondary to those abnormal conditions about the oral cavity which cause an increase in the salivary secretions. In each patient one or more of the following abnormalities were found: Acute and chronic infections of the nasal cavity and its accessory sinuses; the nasopharynx; the pharynx and tonsils, stomatitis, glossitis, gingivitis, pyorrhea alveolaris, decayed teeth with lacerations of the adjacent soft tissues, and during the "teething period" in the infant. No mention is made by those who have reported upon the etiology of perlèche of the increased flow of saliva. In my opinion, this continuous bathing of the epithelium in the salivary secretions causes the primary maceration of this tissue, and this in turn forms a favorable "Port of Entrance" for the exciting organism. In no instance have I seen this infection coëxistent with alopecia areata, as reported by Hyde.<sup>5</sup> In all these cases the Wassermann reaction and the lutein test (this lutein was kindly supplied by Noguchi) was negative.

Perlèche is usually bilateral (in 3 cases of this series it was unilateral) and is limited to the tissues at the angles of the mouth on the external side until secondarily infected, then it spreads to the adjacent skin and occasionally to the mucous membrane on

the inside of the mouth. For description, the course of the disease can best be divided into three stages. During the first stage the affected parts are red and somewhat edematous, but as the epithelial cells become saturated the inflamed area takes on a pearly appearance. The patient complains of a feeling of dampness and tenseness about the corners of the mouth. During the second stage there is a desquamation of the epithelial cells and shallow ulcers with red bases appear. Now, when the lips are separated, cracks form and there is a slight oozing of blood. The opening of the mouth is attended with some pain, but the patient overcomes this to some extent by keeping the areas moistened. There is an irresistible desire to touch these spots with the tongue, and this is not limited to children. The third stage is characterized by the formation of superficial impetigoid vesicles on the adjacent skin areas. These vesicles are filled with a clear serum, but if they do not rupture within twenty-four hours the contents become thick and yellow. When the vesicles rupture, shallow ulcers are formed and these involve only the superficial layers of the skin. Yellowish crusts now form over these lesions. When the crusts, which are composed of dried serum, are raised, yellowish thick fluid escapes. During this stage the lesions have the appearance of impetigo contagiosa, but seldom does the disease progress this far. It usually becomes chronic in the second stage, and as long as the predisposing causes are present there are frequent acute exacerbations. In my experience, it does not often heal spontaneously, as stated by Moro.<sup>6</sup> A white, shining surface remains long after it is considered cured (in 1 case this remained eleven months).

In the differential diagnosis only impetigo contagiosa and syphilis need be considered. Impetigo is more widespread and does not begin at the corners of the mouth. In the rhagades of syphilis the cracks are deeper and more widespread, the lesions are copper-colored and usually affects the mucous membrane on the inside of the mouth, where perlèche seldom appears. The Wassermann reaction and lutein test will usually decide.

The following treatment has given me the best results: The home surroundings must be rendered as sanitary as possible. The abnormal conditions about the mouth must be corrected so that the hypersecretion of the salivary fluids may be overcome. After this the local condition can be treated successfully. Paint the lesions with a 50 per cent. solution of silver nitrate (care

being taken not to have too much on the applicator) and when dry apply Lassar's zinc oxid paste. If the lesions do not disappear in a few days, spirits of camphor or alcohol are applied. If the flow of saliva has not decreased in amount, tincture of belladonna should be given internally until the physiological limit is reached. In 4 of the patients the lesions did not disappear after seven months of treatment by local applications, but when belladonna was given until the salivary secretions were reduced in amount, they soon healed. When pus infections are present the crusts should be soaked with a 1-1,000 solution of bichloride of mercury, then removed and the area covered with 5 per cent. ammoniated mercury ointment.

*Conclusions*—The principal predisposing cause of perlèche is the increased flow of saliva, which in turn is the result of some abnormal condition about the nasal or oral cavity.

The exciting organism is an anaerobic streptococcus.

The staphylococcus invaded the lesions secondarily.

The lesions will not heal permanently until the conditions causing the increased flow of saliva are removed.

My thanks are due Miss Maud Christian, Miss Elizabeth Cooley and Miss Kenerly Brown, dispensary assistants and settlement workers, without whose aid this work would have been impossible, and to my colleague, Dr. W. T. DeSautelle, for many valuable suggestions.

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## SOCIETY REPORTS

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### NEW YORK ACADEMY OF MEDICINE—SECTION ON PEDIATRICS

*Stated Meeting, Held February 8, 1917*

THE PRESIDENT, ROGER H. DENNETT, M.D., IN THE CHAIR

#### DURATION OF ANTITOXIC IMMUNITY IN MAN AND ANIMALS AFTER DIPHThERIA TOXIN-ANTITOXIN INJECTIONS

DR. WILLIAM H. PARK and DR. ABRAHAM ZINGHER made this contribution, which was presented by Dr. Zingher. He stated that active immunization had for a long time been the subject of investigation. More than twenty years ago Dziergowsky was able to produce immunity by the administration of small amounts of diphtheria toxin, but the carrying out of his method required a long period of time and was not practical. Dziergowsky had also attempted to produce immunity by applying diluted diphtheria toxin by means of a saturated pledget of cotton to the mucous membrane of the nose, but this was found to produce local membranous lesions and sometimes necrosis. Attempts to produce immunity with toxin-antitoxin were made in horses by Park as far back as 1898, and in guinea-pigs by Theobald Smith. The method, however, was not used in human beings until 1913, when v. Behring and his colleagues published their results.

Dr. Zingher stated that they had also found that toxin-antitoxin mixtures would produce a considerable amount of immunity in animals and had applied this method to the immunization of children and adults. In their work they soon realized that children immunized with toxin-antitoxin mixtures fell into two groups. The one group comprised those who possessed a certain amount of natural immunity; that was, a certain amount of antitoxin was in their blood naturally; when the toxin-antitoxin was injected into these children they responded by producing a larger amount of antitoxin within ten days or two weeks. The second group comprised those children who had no natural immunity and the majority of whom responded to the toxin-



antitoxin injections only at the end of a longer period of time. At the end of three or four weeks after the injections 25 or 30 per cent. responded by producing some antitoxin. This was less, however, than was produced by those having a small amount of antitoxin in the blood before the immunizing injections.

In testing the efficiency of the toxin-antitoxin only those children who had no natural antitoxin (positive Schick cases) were selected and immunized. Only a certain proportion of these children developed a definite immunity by the end of the second or third week after the injections, but a much greater number became immune by the end of the second or third month.

A series of scarlet fever patients who had positive Schick tests were given the toxin-antitoxin and tested at various intervals afterward. At the end of three weeks about 30 per cent. responded by developing antitoxin; at the end of four weeks an additional number had responded, and by the end of the seventh week a still larger percentage had developed antitoxin. The greatest increase in the number of individuals who developed an active immunity seemed to take place between the sixth and seventh week after the injection.

Dr. Zingher stated that they had tested over 20,000 children in different institutions and had immunized 1,000 that showed no natural antitoxin in the blood (positive Schick cases). These 1,000 were retested at the end of three, six, and twelve months after the injections. The effect of varying the dose from one to three was also studied. They found that the best results were obtained after administering three doses; about 95 per cent. of the children were thereby immunized successfully and gave a negative Schick retest at the end of three months. The three injections were given subcutaneously about a week apart. Most of the work was carried on in institutions by a single observer in order to eliminate any error from the personal equation.

The mixtures of toxin-antitoxin were of varying degrees of toxicity. A slightly toxic mixture was used consisting of 80 to 90 per cent. of an L-dose of toxin, that was from  $1\frac{1}{4}$  to  $1\frac{1}{2}$  units of antitoxin to one L-dose of toxin. Another mixture which was neutral was also used. This mixture consisted of about 65 to 80 per cent. of an L-dose of toxin to one unit of antitoxin, or  $1\frac{1}{4}$  to  $1\frac{1}{2}$  units of antitoxin to one L-dose of toxin. A third mixture was also used in the beginning of the work which was slightly over-neutralized. This mixture consisted of about

50 to 65 per cent. of an L-dose of toxin to one unit of antitoxin, or  $1\frac{1}{2}$  to 2 units of antitoxin to one L-dose of toxin. The toxin was not diluted in any way, the mixture being prepared by the addition of concentrated antitoxin to diphtheria toxin. It was important that in the stronger mixture there should be only a very slight excess of toxin. Even the slightly toxin mixture should not kill a guinea-pig acutely from diphtheria toxin. The mixtures had to be very carefully prepared, but when thus prepared were perfectly harmless. They had found that from 10 to 20 per cent. of the individuals receiving the toxin-antitoxin injections gave local reactions and temperatures of  $100^{\circ}$  to  $103^{\circ}$  F., which soon subsided. If a very severe reaction was obtained it was not due to the free toxin, but was rather due to the protein of the diphtheria bacillus.

If there were any doubt as to whether a Schick reaction was a pseudoreaction, one might make an injection in the other arm with toxin that had been heated to  $75^{\circ}\text{C.}$  for five minutes; the heating destroyed the diphtheria toxin, but did not affect the bacillus protein. The pseudoreaction came on early, reached its height in twenty-four hours, and disappeared by the third day. The true reaction came on about twenty-four hours after the injection and was at its height on the third or fourth day; it then passes through the characteristic stages of pigmentation and desquamation.

With reference to animals, it might be stated that the horse, which was a good antitoxin producer, reacted to toxin-antitoxin injections very much like a human being who had a natural immunity to diphtheria. One group of horses received a single injection of toxin-antitoxin and bleedings were made daily thereafter. There was no perceptible increase in the antitoxin content of the blood until the sixth day, when a distinct increase was noted, and subsequent bleedings showed that the height of the antitoxin content of the blood was reached by the second week. Guinea-pigs acted very much like human beings, who had no immunity (positive Schick cases); it was only at the end of the second month after toxin-antitoxin injections that they showed a distinct antitoxin production.

A study of the curve of antitoxin production in non-immune human beings showed that it usually began about three weeks after the toxin-antitoxin injection; at the end of four weeks about 40 per cent. had responded by the production of antitoxin, and

by the end of the sixth or eighth week, 80 to 90 per cent. were producing antitoxin.

A study of the duration of active immunity shows that when they once become immune they continue to be immune. Their experience with human beings had been that active immunity once produced lasted at least two years; but they would continue to test these children at intervals to determine how much longer this protection lasted. They had found that animals which at first slowly developed antitoxin after the first injection of toxin-antitoxin developed a very much larger amount of antitoxin even within ten days to two weeks after a second injection. It seemed that when the cells were once sensitized by a primary injection and a second dose was subsequently given, antitoxin would be developed very much more rapidly. Experiments along this line suggested that it might possibly be advisable to give a first injection of toxin-antitoxin to human beings, then do a Schick test at the end of three months and at this time, if necessary, give the second and third dose.

Active immunization of susceptible children had been taken up in New York City in some of the schools, day nurseries and milk stations. Also a rapidly increasing number of orphan asylums and infant homes was taking advantage of the Schick test and active immunization with toxin-antitoxin not only to control outbreaks of diphtheria but also as a general prophylactic measure. So far as their experience went the negative Schick test persisted for several years, and possibly through life. This was a very important fact, and indicated the value of carefully preserved records of the Schick test for each child.

DR. LOUIS C. AGER asked Dr. Zingher whether it were advisable to attempt to immunize a child, if that child showed a severe pseudoreaction.

DR. ZINGHER in reply emphasized the fact that these children showing pseudoreactions were immune, and that the injections of toxin-antitoxin were even contraindicated on account of the rather severe local reactions. There were individuals who showed a combined true and pseudoreaction, and these children were not immune. The pseudoreaction was a reaction to the autolysed protein of the diphtheria bacillus. There were a few children who showed the combined reaction; most of them, however, showed either a true or a pseudoreaction. In certain age



groups there were larger percentages of true reactions than in others; for instance between the ages of two and four years about 39 to 40 per cent. gave a positive Schick test. The Schick test was extremely valuable in showing which children needed immunization. They had found in institutions that about 85 per cent. of children between five and fifteen years had a natural immunity so that only about 15 per cent. required immunization.

#### STRABISMUS

DR. COLEMAN CUTLER said that an infant's eye was undeveloped at birth. It was far-sighted\* or hypermetropic, the parallel rays being focused behind the retina, so that even very distant objects were not clear without focusing. There was, however, in childhood a strong power of accommodation which made the focusing of distant objects possible with an effort out of proportion to the amount of effort applied to convergence with which function accommodation was coördinated. It was important to remember then that the child's eye, because it was far-sighted exerted a greater effort to convergence than was needed and, as it kept pace with accommodation, the unstable attempt at binocular vision was relinquished in behalf of the clearer vision obtained by increased accommodation, and the eyes crossed, one eye continuing to fix the object while the other converged excessively, and strabismus resulted. If the eyes were equal, either might fix in turn and alternating strabismus resulted; if one eye were in any way inferior, the better eye tended to assume the active fixation and the squint was unilateral. If, however, one eye dominated, the squinting eye failed to develop or were suppressed, the condition known as amblyopia exanopsia occurred.

Myopia was the converse of hypermetropia. It occurred rarely in young children, but was prone to develop during school age and the divergence or lack of convergence which was sometimes associated with it depended on the lack of accommodation which myopia entailed, and which was excessive in hypermetropia.

The divergent squint of myopia was usually alternating unless one eye was inferior, therefore amblyopia did not occur. Full correction of the myopia under atropin restored the dynamic accommodation and it was often possible to develop fusion and convergence by means of prism exercises. Prisms should not be worn, however, in any case as they took the place of the effort to converge and increase the divergence. In most instances of



confirmed divergence an operation would be needed to reinforce the function of convergence which tended to become weaker as the child grew older. The operation should be an advancement of one or both internal recti muscles.

Inequality of the eyes (anisometropia) should be corrected by glasses.

Opacities of the cornea or other organic defects of one eye might be associated with strabismus, which would be convergent if the fixing eye were hypermetropic and divergent if it were myopic.

Heredity played an important part in the etiology of strabismus, some authors placing its influence as high as 50 per cent., and this was not surprising, as hypermetropia, myopia and astigmatism were influenced in a similar manner.

The nervous and central factors involved in strabismus were more obscure than the peripheral optical and muscular relations, but they were even more interesting. The conditions essential for binocular vision were the predominance of the central region of the retina, the macula, which led each eye toward the object seen, and the impulse to see things as they were, singly, to fuse the two impressions into one. The distinction between the center and the periphery of the retina was not fully developed at birth, but was the result of the growth of retinal elements and nerve fibers by which the macular region gained in perception.

The fusion faculty was also a later acquisition, probably a part of the sensory education which underlies all knowledge gained by experience. Claude Worth, whose observations were most authoritative on this subject, stated that he had found distinct evidence of binocular vision in the sixth month. Normally the development of the fusion faculty was well advanced by the twelfth month and complete before the end of the sixth year. He stated that in analyzing 1,017 cases he had found that 75 per cent. of his cases of unilateral squint developed before the end of the fourth year, and in only  $7\frac{1}{2}$  per cent. was its advent delayed after the sixth year. During these early years it was evident that diseases like whooping-cough, or occasions of emotion or stress, might easily upset the unstable equilibrium and produce the sudden onset so often noticed of a condition for which the predisposing influences had long existed.

The delicate and complicated process of fusion might be disturbed in several ways; any interference with the vision of

one eye, such as astigmatism or opacities of the cornea, which might occur and pass almost unnoticed, might yet leave a permanent defect, and these brief and apparently insignificant attacks of cornea inflammation should receive far more attention from the general practitioner.

Congenital defects within the eye or paralysis of the ocular muscles or birth injuries, might prevent the normal development of binocular vision, but this group was essentially different from those under consideration in which the muscles were not originally at fault, and the squint developed as the result of an attempt to adjust disordered relations between the functions of accommodation, convergence and fusion.

Hypermetropia was an obstacle which must be overcome by an effort of accommodation, and the effort applied was often out of proportion to the purpose, with the result that an actual hypermetropia might stimulate myopia, so that atropin was needed to discover the full extent of the far-sightedness and to make possible its correction by convex glasses. It was obvious that the glass took the place of the accommodative effort or spasm, and that the associated convergence might be relieved in this manner if the glass were given before the habit of squinting was established. The simulation of myopia by hypermetropia might lead to serious errors in the giving of glasses, which instead of relieving the spasm increased it and the associated convergence. Such errors were not rare in these days of optometry.

If the squint became unilateral, the vision in the squinting eye failed rather rapidly and amblyopia from disuse developed and became fixed. The first therapeutic effort, therefore, after the correction of refractive errors was to revive the functional activity of the case, if seen early enough, by depressing the function in the dominant eye and then by the development of the fusion sense to restore binocular vision. In neglected cases, and there were too many of these, the vision in the squinting eye remained seriously impaired, from one-third to one-tenth of the normal, and in many instances fixation was lost irrevocably. Restoration of vision in the squinting eye was possible only if the child were seen very soon after the beginning of the squint, and the younger the child was the more rapid was the loss. A routine examination of all children was not needed if the parents and physician were alert. More depended on the observation of the nurse and mother, as the early evidences of strabismus were

likely to be fleeting and it was at this period of incipency that treatment was simplest and briefest. A child who squinted should not be dismissed without a thorough examination under atropin. Glasses correcting far-sighted astigmatism should be worn constantly, even by very young children, and if the error of refraction were considerable they were accepted willingly. Atropin,  $\frac{1}{4}$  per cent. solution, should be used once a day in the fixing eye to depress its function and this might be continued for weeks. Occlusion of one eye might also be necessary for a prolonged period. If after a thorough and discriminating use of these methods there were no apparent diminution in the squint, or if the case were a neglected one, an operation might be conscientiously advised. If, however, there were any progress, if the unilateral squint becomes alternating, or if there were remissions when the child's eyes were at rest, and especially if the condition permitted fusion training with the amblyoscope, it seemed to the speaker wise and conservative to defer operation.

The hygiene of the squinting child was of first importance. It was often noticed that children squint only when excited or tired. The indications in such children were out-of-door life, the withholding of small toys and tasks and the postponement of lessons where possible, and in any case done at arm's length as on a blackboard. The home life and the attitude of nurse and parents might need revision.

#### THE OPERATIVE TREATMENT OF STRABISMUS

DR. HERBERT W. WOOTON said that since paralytic strabismus was exceedingly rare in children, for the obvious reason that acquired syphilis, its most common cause, was hardly ever present, the operative treatment of strabismus in children resolved itself for all practical purposes into the treatment of the concomitant or non-paralytic variety. This variety of strabismus presented itself under two forms, convergent and divergent, of which the former was by far the more common. The almost invariable operative procedure employed for the relief of these conditions in the past was tenotomy of the muscle or muscles believed to be in a state of spasm. This operation had been to a large extent replaced by, or combined with, operations designed to strengthen the action of the muscles believed to be weakened by disuse.



In the surgical treatment of the convergent variety we had the choice of one of three operative procedures—tenotomy of one or both interni, advancement of both externi, or the shortening or advancement of the externus of the deviating eye combined with tenotomy of its internus. In uncomplicated cases the author's experience had been almost entirely confined to the first and second methods, and in choosing one or the other he thought we should be guided by certain circumstances of the individual case. He thought it was true that an advancement of both externi to the corneal margin, in so far as the permanency of the results and the possibility of restoring binocular vision were concerned, was the operation of preference but a rather extensive experience with its use had convinced him that it might at times be advantageously abandoned in favor of tenotomies. When the squinting eye possessed very little vision, was in a high degree amblyopic, no operative procedure could be relied upon to produce a permanent cure, and it seemed rather useless to subject the patient to the inconveniences of advancements, or the surgeon to the difficulties of their performance. In such cases a tenotomy of one or both interni, just sufficient to undercorrect the deviation slightly, was, all things considered, the better procedure. The great disadvantages of this method was that gradual divergence would subsequently ensue, but in the cases mentioned ultimate divergence would probably follow any method, and if we undercorrected the deviation slightly it was possible to maintain a good cosmetic result for years by the proper employment of glasses.

Again, when the eyes were deeply set, advancements were difficult to perform, and their cosmetic effect was far from pleasing. After a tenotomy an eye protruded slightly; after an advancement it receded slightly, and in the cases mentioned the ultimate result of advancement of both externi was that an expression of cunning is produced. Another disadvantage of advancements was that they left behind them for a considerable period of time a yellowish discoloration at the site of the operation.

Tenotomies should be employed when the vision of the squinting eye was fairly good, when the eyes were fairly prominent, and when the parents did not object to the patient's confinement in a hospital for a week. Under such circumstances an advancement of both externi would procure better and more lasting results than any other method. In performing tenotomies



one must be guided by the amount of effect desired and should leave a slight degree of squint uncorrected. In all cases the externi should be advanced to the corneal jargon, whether the squint be one of 10, 20 or 30 degrees.

On the other hand, the technic of tenotomy was simple, while that of a thorough advancement was complicated. The former could generally be performed under cocain, while the latter necessitated a general anesthetic. The after treatment of tenotomies amounted to nothing, while a double advancement required attention for a week. Nevertheless, advancement of both externi unaccompanied by tenotomies was greatly to be preferred in suitable cases. The surgical treatment of divergent strabismus was more complicated than that of the convergent variety and should depend entirely upon the character of the muscular anomaly that was causative. This thesis had not been sufficiently promulgated. Another point that should be emphasized was that while glasses should always be prescribed in convergent cases, and by their employment cures without resort to operative measures might frequently be accomplished, they were of no curative value whatever in a very large class of those of the divergent type.

When the squint was associated with myopia and insufficiency of converging power, advancement of both interni was the proper procedure, and was invariably followed by good results. When the deviation was associated with hypermetropia and an excess of diverging power, a free tenotomy of the externi, repeated if necessary, would be equally successful. In the first class of cases, tenotomies of the externi and in the second, advancement of the interni would always result in failure.

It would seem from these statements that the operative treatment of divergent strabismus ought always to be successful, and so, in the author's opinion it was, in the two classes described which constitute the greater number of our cases. Unfortunately there remains a group in which refractive and muscular errors were neither so clearly defined nor so distinctly associated. Thus, for instance, we found cases in which one eye was hypermetropic and the other myopic and others in which the muscular anomaly was a combination of an insufficiency of converging power and an excess of diverging power. In these cases the result of operative measures could not be so accurately prognosticated. When one eye was myopic and the other hypermetropic the prescrip-

tion of glasses was usually of no value, and in operating we should usually attack the muscular error, which was more prominent. If we were finally compelled to add a tenotomy to our advancements, or an advancement to our tenotomies, we must expect that we should sometimes produce an over-effect. A slight overcorrection of divergent strabismus was not, however, as disastrous as an overcorrection of convergent strabismus, for while a slightly convergent strabismus was hardly discernible, a slight divergent squint was a noticeable deformity.

DR. WALTER B. WIEDLER said that he first wanted to emphasize the importance of getting glasses on these children early. If medical men could be made to realize the importance of correcting errors of refraction by proper glasses, he believed many cases of amblyopia might be prevented, for he believed that in many cases the amblyopia came on after the squint had developed, and when it once began it grew apace with the squint. If we could give relief normal vision might be restored and amblyopia prevented, and we might develop the fusion sense so that we could procure equal convergence of both eyes.

In the treatment of unilateral constant squint the results to be worked for were: (1) Prevention of further loss of vision and the restoration, if possible, of normal vision. (2) The removal of the cause of squint, if possible. (3) To bring both eyes to a parallel converging axis. These results might be obtained by: (1) Correcting the refraction. (3) By the instillation of atropin in the fixing eye. (3) By occlusion of the fixing eye. (4) By training the fusion sense.

In correcting the refraction a mydriatic should be used and the eyes tested three or four times. Hypermetropia and astigmatism were present in 95 per cent. of the cases of convergent squint, though a small percentage might be myopic. Myopia and astigmatism were associated with divergent strabismus. In hypermetropes one should prescribe correction or a little less ( $+0.50$ . sp.). For myopes full correction should be prescribed. Glasses must be worn constantly. Many parents objected to this because they feared that the glasses might be broken and the eyes injured. Dr. Wiedler said that he had still to see an eye that had been injured by broken glasses. Personally he gave glasses very early, having given them as early as the eleventh month. The children soon learned to wear them just as they would any other article of clothing.

The use of atropin in the fixing eye might be continued for weeks or months and was useful as it made the squinting eye do all the work, and as a result of this measure one often found a very decided improvement in the vision of the squinting eye. The child was compelled to use the squinting eye for all near point seeing and reading and amblyopia was thus prevented. Improvement might be noted in these cases after weeks, months, or even years of treatment. The oculist should see these children at first twice a month and then once a month.

For occlusion of the fixing eye a bandage was usually employed. This measure was suitable for cases in which the vision was very poor and there was a high degree of amblyopia, and where the child's eyes had been neglected for years. Continuous occlusion was sometimes difficult and troublesome to apply as the pad must be changed every day. Vision should be tested at the end of a month and if improved one could change to atropin instillation. If vision did not improve in three months its recovery was doubtful.

Worth's amblyoscope might be used in the attempt to restore the fusion sense but it was rather difficult to get the continued coöperation on the part of the parents and the child. It was best used between the ages of three and five years.

In alternating convergent squint there was usually no amblyopia; in these cases glasses would usually accomplish all that was necessary.

DR. ALEXANDER DUANE said there were two very important points that should be kept in mind in the consideration of squint in children. The first of these was that there were three varieties of squint differing radically in nature and treatment. The first, comprising the large majority of cases, was acquired squint. Nearly all cases of acquired squint in children came under the head of the concomitant convergent strabismus of which Dr. Cutler had spoken and which he had described so well that he had left little for anyone to add. This form of squint developed usually at from two to five years of age, and represented an excessive convergence due to hypermetropia. It passed through various stages, the development of which we could observe. It was treated first by means of glasses which should be worn constantly from the earliest age; second, by training with the amblyoscope and stereoscope; third, by educational exercises of the squinting eye, reinforced by atropinization and bandaging of the



good eye. It was marvellous what good results could be obtained both in straightening the eyes and sometimes also in improving the sight of the squinting eye if we got these children early enough and treated them diligently. Only when one could be sure that no more could be done for the child by these means should we consider the question of operation, and then we should operate according to the indications of the individual case as Dr. Wooton had said.

The second class of cases, comparatively small, but yet important, comprised the congenital cases. There were several distinct types of these, often so clearly marked that they could be recognized in babies five or six months old, in whom one could make out even the muscles affected. These cases were usually peripheral—due to actual changes in the muscles themselves, very rarely to central nervous changes. It could easily be proved that these anomalies often caused the child trouble due to the confusion produced by the double vision. In order to overcome this Dr. Duane said that the child often adopted the expedient of shutting one eye so as to exclude one of the two images, or as this soon proved troublesome he tipped his head so as to make it easier to overcome the diplopia. The attitudes assumed were characteristic and could be made out at a very early age. A third way in which the child helped himself to separate the double images so widely that they no longer caused confusion was by diverging or converging the eyes, thus giving rise to the third or mixed variety of strabismus. The congenital type of squint could be relieved only by operation.

The third class or mixed cases comprised those which began with a congenital squint, usually a vertical one, and afterward developed an acquired squint in addition. In many of these cases this secondary acquired squint represented an involuntary divergence or convergence of the eyes, set up in the manner already indicated in order to avoid confusing double images. These cases were fairly common and a failure to recognize their composite character was a cause of the failure to cure them. If we wished to succeed we must first relieve the vertical squint by operation. This alone might relieve the lateral deviation, too; if not the latter could be treated according to the rules laid down for ordinary concomitant squint.

The second point, and it was a very important one, was that the diagnosis and treatment of these cases should be undertaken



just as early as possible. Too often the contrary practice obtained. It was taught that no harm was done by leaving a squint untreated until the age of nine or ten when, if necessary, the child could be operated upon. Others laid stress on the fact that the squint sometimes cured itself. This was true, but a spontaneous cure occurred in a small minority of the cases, and even so the result was not as satisfactory with regard to vision as if the child had been treated properly from the first. In all other cases if we let the time go by without treatment we failed in our duty in two respects. First, we failed to relieve the symptoms from which the child evidently suffered—symptoms which were obviously relieved by the glasses which the child accepted gladly. Second, we missed the chance of restoring binocular vision and of increasing the sight of the squinting eye. In other words we had missed the chance to apply a method of treatment which both as regards vision and cosmetic result gave better results than operation.

Likewise in the congenital and mixed cases it was important to begin treatment early. Such cases might develop various disabilities, for example a false wryneck, which could be relieved by operation on the eyes.

Dr. Duane showed pictures of a child which demonstrated the immediate effect produced on the position of the head by an operation of this sort. So, too, in the mixed cases the earlier the congenital element was relieved the more satisfactory would be our results, and as already stated unless this element was relieved the results would be disappointing.

#### DISCUSSION OF PAPERS ON STRABISMUS

Dr. ISAAC W. HELLER said there were one or two points that he would like to speak about. These cases of strabismus which were complications of brain lesions were ruled out of their discussion because in them there was always some other symptom very much more important than the strabismus.

It was a good rule to remember that no normal eye squinted. He said this because it happened that children came to him with strabismus and the mothers said they were all right until something happened, as for instance until the child had measles or whooping-cough. The physician had told her that the strabismus was not of much significance and that she should wait a month

or two before consulting an ophthalmologist. She waited, not a month or two but a year or two, before consulting an ophthalmologist and the child continued to squint. She said her doctor made very little of it. Now if the child was a girl the cosmetic effect was very important as is readily understood, and if the child was a boy the strabismus would be a handicap in business. A child with this defect was teased by his playmates and became shy and altogether the defect was a great handicap. So when the physician saw a strabismus he should send the child to an ophthalmologist. There is an impression that a child with strabismus should not be operated upon until he was five or six years old, and that if he was sent to the ophthalmologist an operation would be advised. As a matter of fact the ophthalmologist did not advocate an operation until the child had worn glasses for six months or a year. If at the end of that time he was improving there was no necessity for an operation and none was performed.

Another point of importance was that the mother of a child often said the child was not cross-eyed but only had a cast; people did not like the term "cross-eyed" and so called the defect a cast. It was important to emphasize the fact that a cast was strabismus.

DR. WIEDLER had said that we could not put glasses on a child with strabismus at too early an age and had cited an instance in which he prescribed glasses for a child of eleven months. The speaker said that he had a child under observation who had worn glasses since the age of nine months. One could accustom such a young child to glasses by getting a cheap frame and having the child wear it for a week or two without any glasses in the frame. Then when the child became accustomed to wearing the frame good glasses could be put on. Children who had become accustomed to wearing the glasses and to the relief that they gave cried for them when they were taken away.

DR. WOOTON, in closing the discussion, said that in regard to the objection that was made to his statement as to the treatment of paralytic strabismus, it must be remembered that his subject was the operative treatment and he does not think that the cases of strabismus resulting from poliomyelitis come to operation. It is a fact that paralytic cases are relatively infrequent and he therefore omitted a consideration of the treatment of paralytic cases.

In regard to what Dr. Tenner said, that he did not think there

was any difference between shortening the externi and doing a tenotomy of the interni the following is true: One may advance the externi and then reinforce it by a tenotomy of the interni, and while one might think there was not much difference in the results to be obtained by these two procedures one gets better results by the advancement of the externi.

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PERTUSSIS—Czerny (Jahrb. für Kinderhk., Berlin, June, 1915, Vol. XXXI., No. 6, pp. 465-562) relates that for eighteen years he has made a practice of refraining from isolating children with whooping-cough, as he has found that a few simple precautions are all that is necessary to prevent infection of others with this disease. Every child that coughs is regarded as a pertussis suspect, and is never allowed to come closer than 1.5 meters (about 5 feet) to the other children. No droplets can be expelled by a child farther than this, and the disease is not carried by the attendants' hands or clothing. No cubicles or boxes are necessary, merely reliable attendants to see that none of the pertussis children approach nearer than 5 feet to any of the other children in the ward. By care in this way there need be no fear of a child's contracting pertussis when in the hospital for some other disease. He has never had whooping-cough spread in the institution. In the home, if the pertussis child is never allowed to approach his brothers and sisters nearer than 5 feet, they will not contract whooping-cough from him. The above applies only to children over a year old. Infants are peculiarly susceptible to pertussis and the attendants are liable to convey infection from one babe to another. When each infant has its own nurse, this does not occur. Infants are peculiarly susceptible to infections of the nose and throat, and they begin to cough on the slightest provocation, and the cough is liable to be of a spasmodic type. His extensive research has not demonstrated any causal connection between the Bordet-Gengou bacillus and pertussis. It was found only sixteen times in 42 cases, but Inaba was able to cultivate it from 77 to 81 cases. Czerny has always found pronounced lymphocytosis in the cases of pertussis examined for it, so that the absence of lymphocytosis justifies exclusion of pertussis in a child with spasmodic cough. The spasmodic cough also may persist as a purely nervous phenomenon after the pertussis mucosa affection has long healed.—*Journal A. M. A.*

TWENTIETH ANNIVERSARY OF  
THE PHILADELPHIA PEDIATRIC SOCIETY

*Stated Meeting, Held December 12, 1916.*

THE PRESIDENT, JOHN F. SINCLAIR, M.D., IN THE CHAIR

FRANK SPOONER CHURCHILL, M.D., Rush Medical College, Chicago, Ill., read a paper on "The Possibilities of a Pediatric Society."

Dr. Churchill said: "The object of any medical society is, speaking broadly, the self-improvement of its members to the end that they may better perform their duties whether as private individuals towards their patients or as citizens towards the community. Another object of a medical society is, or should be, service on its part as an organization to the public at large. The functions of a medical society are thus of a twofold nature, private or individual, public or communal.

"A pediatric society is an organization or group of people interested in the study and welfare of the child. Like medical societies in general it has a twofold mission to fulfill, individual or private, communal or public. The field of such a society is however circumscribed and limits itself to study of various phases of child-life. To a comprehensive understanding of the scope of its work we must keep clearly in mind what we mean by the term 'pediatrics.'

"To the pediatrician pursuing his daily work in a large American city, there is much food for reflection as he observes and comes into intimate contact with the conditions affecting the child of to-day almost from the time of conception up to and through the age of puberty. As he contemplates this widely extended field he sees four phases of the individual's existence, distinct yet merging the one into the other, in each of which the individual's development may be and often is seriously affected by social or community condition: First the period of his intrauterine life during which his mother's physique and therefore his own is affected by her external surroundings; second the critical passage from intra to extrauterine life, the period of the newly-born with its sudden change to a new and totally different environment; third the period of infancy, and fourth the more prolonged period of childhood, early and late.



"The conditions affecting the individual during the second and third phases of his existence, the periods of the newly-born and of infancy, are perhaps less intimately connected with industrial and community states than are those during his first period. We have to do here with individual rather than community conditions, inasmuch as we have to combat chiefly personal ignorance on the part of the attendant during labor, on the part of the mother herself during infancy.

"As the individual merges from infancy and passes now into the fourth and final one of the periods which we are considering, that of childhood, he becomes exposed directly to general community conditions. He begins to mingle with his mates in back yards, on sidewalks, streets, and alleys, in kindergarten and school. During the first part of this period his chief danger is exposure to communicable disease and the development of physical defects which unremoved may permanently affect his growth; during the latter part of the period he encounters two unfortunate community conditions; unwise school pressure when kept at school, consignment to hard, unhygienic labor when permanently removed from school.

"So inextricably interwoven with the social life of the community have many child-problems become, so complex and many-sided are they, that complete private management is impossible and can never solve these problems entirely. Private effort may do much to help, but cannot and should not possess authority. Thus in the infant-welfare movement, private organizations equip and maintain stations with a high degree of efficiency, instructing and training thousands of mothers in the care of their infants; private agencies however cannot control the conditions of streets and alleys, cannot dictate housing conditions, cannot regulate a city's milk supply derived as it is from several different states with widely different dairy laws. Obviously the police powers of the government must be invoked to control such conditions. Hence it is that many students and workers of this special problem believe that this work, now generally maintained by private agencies must eventually be taken over and carried on by the municipality—not a pleasant thought when one contemplates the helplessness of the infant and the rottenness of city government in this, our 'so-wonderful' country!

"Let the pediatric society be so organized as to lend its aid to the study and solution of the various community problems already

discussed and for this purpose let there be established, in addition to the usual executive committee, certain standing committees as follows:

"A Committee on Infant Welfare.

"A Committee on Schools and Education.

"A Committee on Play Grounds and Gymnasias.

"A Committee on Legislation, Child Labor and Juvenile Courts.

"The establishment and conduct of juvenile courts and the enactment of child-labor laws have not to my knowledge, ever received from pediatricians either as individuals or societies, the attention and support which their importance demands.

"In the difficult and widespread field of child-labor, the cruelties and burdens borne by the young in our great prosperous country constitute a national shame and disgrace, well known to us all, crying aloud for all, with or without medical training, to make every possible effort to correct the evil. A pediatric society can well lend its influence to the amelioration of this suffering class of children.

"It goes without saying that work of this public or community nature should not crowd out or displace the individual work now being done by pediatric societies. This more personal work, these exhaustive studies on the child already sick, on the machine already out of order, should and must be pursued. I do not intend, nor is there any danger, that studies on the pathology and physiological chemistry of the child should be neglected or curtailed. But in addition let us broaden out our roots of things, strive constantly and insistently to destroy causes which make the child sick, which force him sick and in great numbers into our hospital wards, into our juvenile courts, out of our playgrounds, out of our schools prematurely into factory, shop and mill; in a word let us apply broadly the general principle of 'preventive medicine,' or 'preventive pediatrics,' to these complex problems so seriously threatening the child-life of the nation.

"I believe that efforts along the lines indicated in this paper, efforts both individual and organized, will do much to make our country a better place for children to live in, much to improve the quality of coming generations, will contribute much towards what is after all the greatest object in life, the rearing of healthy and happy children."

JOHN HOWLAND, M.D., The Johns Hopkins University, Baltimore, Md., read a paper on "The Future of Pediatrics."

Dr. Howland said: "The justification for the existence of pediatrics as a specialty rests largely upon the study of two types of disease—the nutritional diseases of infancy and early childhood and the infectious diseases, including the exanthemata. The infectious diseases, while common to all ages, are in many instances particularly apt to affect children, at least in cities where constant opportunity of infection is given. Thus it has come about that at the present time the diagnosis and treatment of measles, scarlet fever, chicken-pox, pertussis and similar diseases are almost entirely in the hands of the practitioners of the diseases of children. These two types of diseases, the nutritional and the infectious, belong to the domain of the pediatricists. The trunk of pediatrics has, therefore, two main roots.

"It seems reasonably safe to maintain that for the future which lies within our horizon the advances that are to be made in these two fundamental departments of pediatrics, the nutritional and the infectious diseases, will be made with the assistance of chemistry and bacteriology with their several subdivisions. It is quite evident, also, that chemical methods of investigation in pediatrics have undergone a considerable alteration, even in the last fifteen years, which is almost the limit of their application. In the last few years, great strides have been made in the understanding of the chemical processes of intermediary metabolism chiefly by means of analyses of the blood. These have been made possible by an elaboration of a number of microchemical methods—methods sufficiently accurate to determine most minute quantities and yet with a degree of accuracy insufficient for the purpose. With these in hand, studies have been made of fundamental importance. It is quite sure that these methods will increase in number and in application and that the knowledge gained by their means will be much greater than that gained by the older method of balancing the ingesta against the excreta.

"The infectious diseases are the other great root of our stem. They are many and vastly important and yet with the single exception of diphtheria they are very improperly understood. Upon the accurate and complete knowledge of their etiology depends the possibility of successful therapy. So far as we know, at the present time, treatment of this class of diseases *must* be with biological products, and until we can separate the offending bac-



terium or virus, cultivate it and obtain biological substances detrimental to its life or antagonistic to its poison, we are far from our goal.

"In the study of both these types of diseases, the nutritional and the infectious, specialized knowledge is absolutely necessary; for the former, it is largely chemical, with the latter, it is largely biological, and this brings up the question: Who is to make these studies? Is it the clinician trained as the clinicians of the past have been and as the majority of those of the present generation are? Certainly not. We have been trained, with few exceptions, with but slight emphasis upon the fundamental sciences. We have been trained for diagnosis and for treatment and I might say, parenthetically, very imperfectly trained, for without the knowledge of the fundamental sciences diagnosis cannot be sufficiently exact, nor therapeutics sufficiently intelligent. It seems unlikely that the clinician not provided with knowledge of the fundamental sciences will contribute very much to the pediatrics of the future. The clinician has a most important position in the community to fill and he fills it well, but the better he fills it the more demands are made upon his time, his thoughts and his strength. The clinician has always been essentially an observer, and the ground that he must cover has been already covered by generations of shrewd, careful observers and they have seen, not all, of course, but most, of what appears upon the surface. At the present time one must dig below the surface.

"It seems that the contributions are to be made by clinicians but clinicians trained in a very different way from that in which they have been trained in the past—by those who have, in addition to their medical education, an insight into the fundamental medical sciences, those who have devoted several years either before or after their medical school years to routine and research in chemistry, biology or physiology. Such men, as clinicians, appreciate those problems which are most necessary and most important for attack. As scientists they recognize the means by which they can be attacked and discard or postpone until some further means are provided, the problems for which there are at the present no appropriate methods for study. This seems the hope for the future.

"It would be unfortunate to give the impression that the hope for the future lies only in the new information that is to be gained. There is much knowledge at the present time of which



advantage is not taken. It should be spread. Our duty is to cure disease. It is also to prevent disease. We may say without exaggeration that the larger part of the distressingly great mortality among infants and young children is preventable and by methods already known.

"What is roughly outlined seems what we are to expect in the way of advance from pediatrics in the future. The one body of men will increase the knowledge of all diseases to which the young are liable, but chiefly of those that are the foundation of pediatrics, the nutritional and the infectious diseases, and they will do this largely in hospitals and institutes with special facilities. The other body will by precept and example, educate those who are given the care and rearing of children. For both of these purposes, the investigative and the educational, the organization is being perfected. There is no justification for dissatisfaction with the outlook. The future is bright with hope."

HENRY DWIGHT CHAPIN, M.D., New York, read a paper on "The Relation between Pediatrics and General Medicine."

Dr. Chapin said: "The evolution of pediatrics into the dignity of a specialty has been of comparatively recent date. It is still in process of development. Many obstacles have been encountered in the ascent of this important branch. Some questions are yet in process of settlement. The relation between pediatrics and general medicine and the position the former is destined to occupy will be determined largely by societies and occasions such as this. It is not necessary to dwell upon the great importance of pediatrics before any medical assemblage.

"The general public, professional as well as lay, however, often seem slow in recognizing relative values in the different departments of medicine. The beginnings of life certainly constitute the most favorable period for studying all the phenomena of life—normal as well as abnormal.

"Pediatrics is simply applying the study and practise of internal medicine to one part—and that the most important period of life. Here, as in other branches of medicine, we must avoid the danger of over-specializing. When pediatrics is treated as an extreme specialty, the tendency is to detach it too much from general internal medicine, and both thereby are likely to suffer. It is a mistake to carry to extremes the specialization of any branch of medicine. While there may well be specialization in technique, it should ever be kept in mind that infants, children and adults

are not different species, but merely different forms or stages of a single species.

"The chemical basis of life is the same at all stages of the life cycle. The same fundamental food materials are used by the embryo, the infant, the child, the adult and the aged. The form of the food materials may not be the same at all stages of life for change in form of the food goes hand in hand in some instances with a change of form and structure in the individual. Milk is a striking example of this fact. Here is a liquid food which turns into a solid under the action of the stomach secretions, the degree of solidity keeping up with the capacity of the stomach to utilize food of increasing density. The casein of milk has a developmental as well as a nutritional function which has been brought out by a study of the biology of nutrition in connection with the various milks.

"The finest possible training for the general practitioner and specialist can be procured by paying full attention to the problems of infant care and nutrition. Here the physician must depend upon his own powers of observation, for the infant cannot tell him anything. It is almost like a laboratory training.

"The chemical processes of nutrition in the adult are the same as in the infant and if they were better understood it would not be difficult for the same physician to manage this problem with either infant or adult. As long as the stress is laid upon matters of form and technique in nutrition, so long will it be necessary to specialize in this direction. Remedy for this over-specialization is a completer knowledge of the basic principles of general nutrition in connection with the changes of form and structure during development.

"While the study of pediatrics in its broadest outlook reaches out into almost every field of endeavor, there are thus some phases that are peculiarly its own. It is often necessary to start with embryology and consider developmental defects and diseases of the fetus itself in order to fully understand conditions that may ensue after birth.

"Of the three great critical periods of life—birth, adolescence and beginning old age—the first is the most important.

"It would take too long to recall all the list of diseases that so well repay special study during the early years of life. Rickets, the commonest developmental disease of infancy, may be particularly mentioned as warranting future study. The susceptibility

of infants to bacteria, due to their active metabolism, is shown in many kinds of sepsis and must always concern the practitioner.

"The study and treatment of actual disease is not all that concerns the pediatrician. No branch of medicine opens out into such a wide field of prevention and sociological investigation. Nowhere does medicine touch life in such a close connection as with the child. Permanent race betterment must be accomplished entirely through the young. Infant mortality is thus a grave and pressing problem for the pediatrician.

"In later years, school hygiene should be regulated more by the pediatrician than by the politician. Too long sessions, cramped positions from improper chairs and desks, imperfect ventilation, poor lights and a bewildering variety of studies are all too frequently present and handicap the child during the school age. Not only health departments but school boards and even legislatures should include competent physicians in their membership. The pediatrician is needed to instruct the pedagogue in some fundamentals of child nature and growth. The latter might not fail so frequently if he had the benefit of such instruction.

"One of the great services that pediatrics may render to medicine is in the field of original research. It offers to-day the most promising field for advanced work in scientific and experimental medicine.

"All the specialties require a thorough grounding in the underlying principles of medicine. The old idea that work in any specialty should be preceded by wide experience in general medicine still holds. The quick step from medical college to a specialty, without this previous experience has proved disastrous. It has produced a group of skilled medical mechanics rather than broad-minded physicians who can work in a specialty without detaching it too much from all relations to general medicine. Pediatrics should be one of the broadest of the specialties—it has been aptly described as the specialty of the general practitioner."

## THE PHILADELPHIA PEDIATRIC SOCIETY

*Stated Meeting Held January 9, 1917*

THE PRESIDENT, J. F. SINCLAIR, M.D., IN THE CHAIR

DR. DAMON G. PFEIFFER showed a specimen of congenital pyloric stenosis. The patient was a girl, aged four weeks, the only child of healthy parents. At birth the baby weighed 7 pounds, 13 ounces and was apparently normal. For the first week the child took the breast and showed no digestive disturbances. During the second week she began to vomit occasionally. Various formulas were tried without effect and the vomiting grew worse while the baby lost weight rapidly. The bowels moved scantily. In the fourth week Dr. Charles A. Fife was called in consultation by the attending physician, Dr. George A. Parker, of Southampton. Visible gastric peristalsis could now be observed at times but no epigastric tumor was palpable. The child displayed evidence of ravenous hunger, taking food eagerly and sucking its thumbs. With the diagnosis of hypertrophic stenosis of the pylorus the patient was referred to Dr. Pfeiffer at the Abington Memorial Hospital, for operation. The weight by this time was barely 4 pounds. The pulse was exceedingly thin and weak and the temperature subnormal.

Under ether anesthesia, a posterior gastrojejunostomy was made without special difficulty. Hypodermoclysis was given during the operation and the patient left the table in good condition. She vomited once the following day and the stomach was washed out, a small quantity of biliary material being obtained. Feedings of whey were begun. The next day the baby showed evidence of excessive weakness and died a few hours later.

At postmortem the peritoneum was everywhere glistening and showed no evidence of peritonitis. The gastrojejunostomy was mechanically satisfactory. The pyloric canal for a distance of about an inch was tightly constructed, as had been observed at operation, by a thickened muscularis measuring 6 mm. in depth at its thickest part. There was no apparent oedema. The longitudinal incision through this part of the muscularis was made after removal of the specimen and shows beautifully the distinctness of the separation of the muscularis from the submucosa and the elasticity of the latter, thus illustrating the ease and effective-



ness of a Rammstedt procedure which was considered, but not practised in this case. It shows also the sharp limitation of the muscular thickening to the gastric side of the pylorus, an important point to observe in performing the Rammstedt operation because of the ease with which the duodenum may be opened.

The case illustrates the fact which has been pointed out by Holt, Downes and others, that sudden collapse may occur in these weakened infants with or without relief of the obstruction, and shows the advisability of resorting to surgical measures at an early period.

DR. D. J. M. MILLER has seen quite a number of cases of pyloric stenosis. None of these have come to operation and many have recovered. He believes that all cases of stenosis have more or less hypertrophy.

DR. H. B. MILLS asked what the operative mortality was.

DR. JOHN F. SINCLAIR asked Dr. Miller of what his treatment for this condition consisted. Dr. Miller said that the main points in the medical treatment of pyloric stenosis consisted in feeding at long intervals and in small quantities on the theory that it is better to take 10 ounces and retain all, than to take 20 ounces and vomit 15. Stomach washing was used once or twice a day. Small doses of atropin he had found to be of service. In one case removal of the fat from breast milk was the deciding factor. Sometimes buttermilk was the food which would pass the pylorus.

DR. PFEIFFER said that as in appendicitis, it was often hard to tell what cases would recover without operation. He believes that some cases would be saved by operation that would die under medical treatment. The baby from which the particular specimen that he demonstrated was removed, was operated upon because she would undoubtedly have died without operation and had a small chance with operation. He had consulted many authors and found that the mortality for medical treatment was often as high as 53 per cent. The mortality in 66 cases operated on by Downes in New York, was less than 23 per cent.

DR. J. A. PERKINS showed a case of thrombosis following measles. The patient was a girl of six years, whose family history and past history were negative. Six months ago the child developed measles. Following the attack the mother noticed an internal strabismus and later that the child staggered slightly when

she walked. Prior to the attack of measles the child had been quite bright, but since then has been distinctly backward, and until very recently has talked but little. On examination the following salient points were elicited: A large square head; thick heavy neck; apathetic expressionless facies; convergent strabismus, lateral nystagmus, equal pupils which react to light and accommodation; normal reflexes. The intellect seemed impaired and the child was very unresponsive. The gait was unsteady and staggering with a tendency to fall to the left. The feet did not drag.

By spinal puncture 25 c.c. of clear fluid under normal pressure was withdrawn. This fluid had a total cell count of 20, of which 12 were polymorphonuclears and 8 lymphocytes. There was a marked reduction of Fehling's, no globulin. There were no bacteria either in smear or culture. The first Wassermann reaction was a delayed negative, and the second was negative. The von Pirquet was negative. The blood showed 82 per cent. Hb., 4,380,000 R.B.C., and 8,400 W.B.C. and a normal differential count. The first urine examination showed a trace of albumin and some hyalin and granular casts, although subsequent specimens were normal. Eye examination by Dr. Shumway showed convergent strabismus of the right eye; the left eye will fix but not retain; the left eye moves outward, but not as freely as the right; almost constant nystagmic movements, which are greatly increased on moving to the right or left; the eye grounds are healthy; the pupils equal and respond normally. The condition is probably not paralytic.

DR. BURR suggested the possibility of cerebellar thrombus at the time of the measles, although the present condition may be merely the residual effect of a basilar meningitis, and a primary degeneration of the cortex must be considered.

The Barony tests by Drs. Jones and Fisher suggest a lesion of the brain stem in the posterior aspect of the upper portion of the antero-superior portion of the pons, involving the adjacent portion of the antero-superior portion of the cerebellum. During the time that the child was in the Children's Hospital until the present she has shown some improvement, although the gait is still unsteady and there is slightly increased swaying on closing the eyes when standing with feet together. Performs finger-to-nose test well. The child seems more intelligent and at times will talk. She has a partial paralysis of the muscles of the right side of the face.

DR. SPILLER suggests hydrocephalus and cerebritis, resulting from occlusion of aqueduct of Sylvius, which in turn may have been due to a meningitis following occlusion of an artery supplying the part (possibly a thrombus at the time of measles).

An X-Ray of the head made by Dr. Bowen was negative, except for a slight thickening of the right maxillary sinus.

DR. BURR said that this case was illustrative of the fact that measles was not without serious consequences.

DR. W. H. JOHNSON showed a case of malposition of the colon. The patient was a boy of nine years of age. The child's mother died of tuberculosis and, although there are 4 other children in the family living and well, none of them present any disturbance of the gastrointestinal tract. The present illness dates back to infancy and was manifested by persistent constipation. Up to the third year, castor-oil or salines acted satisfactorily if given in large doses. At this time, however, the child went for eight days without a bowel movement. Unsatisfactory stools then resulted from enormous doses of cathartics. Since that time constipation has been growing more obstinate and now the child will sometimes go for a period of two or three weeks without a bowel movement. During these attacks he does not vomit; his appetite does not fail until about the sixth day and he suffers from headache and malaise. He does not have fever and the abdomen is not noticeably distended until the second week. He has epigastric pain. During the intervals he is apparently in good health. At the time of showing the child, he had not had a bowel movement for nine days. His abdomen was distended and for the most part tympanitic.

Dr. Johnson said that when the abdomen was not distended there seemed to be a slight tenderness over the epigastrium and a palpable mass in the lower right quadrant of the abdomen. The liver and spleen were not palpable. The urine contained an excessive amount of indican. The X-Ray report by Dr. Mangus furnished the diagnosis: "The descending and part of the transverse colon appear to be on the right side—probably as a result of a failure of rotation of this part of the bowel. The sigmoid flexure is in the midline and the cecum is presumably obliterated by the malposed section of the bowel. No kinking of the bowel is demonstrable. The descending and transverse colon are greatly dilated." Dr. Johnson said that the prognosis of the case under medical treatment was very unfavorable.

DR. ROSTOW recalled a case similar to this in an adult.

DR. MILLER spoke of the fact that autointoxication in these conditions was usually slight. He recalled a case of an infant three months old with a stenosis of the anus whose whole colon was filled with feces and yet was quite well nourished.

DR. H. B. MILLS spoke of a patient of his, an adult, who for years had had only one bowel movement a week.

DR. MAURICE OSTHEIMER then read a paper on "Feeding in the Second Year." As a result of feeding over 600 infants, from twelve to twenty-four months of age, in the past six years, Dr. Ostheimer believes that the common practice of five or six meals consisting chiefly of milk and broths should be discontinued, and infants fed only three meals a day.

The transition from milk to solid food should be gradual; gradually increasing the amount and number of foods given; allowing drinks of milk half way between meals until the baby takes three good meals. All food should be carefully prepared, and the baby fed slowly. Nothing to eat is allowed between meals.

The three meals consist of: (1) Breakfast, between 7 and 8: Strained cereal, stewed fruit, toast, zwieback or stale bread, with butter; soft-boiled egg, and milk. (2) Dinner, between 12 and 1 P.M.: Baked potato, green vegetable, stewed fruit, toast, zwieback or stale bread, with butter, and milk daily; with meat or boiled fish twice a week, and cornstarch, custard or milk pudding twice a week. (3) Supper, between 5 and 6 P.M.: Stewed fruit, potato, cornstarch, rice, custard or soft-boiled egg, toast, zwieback or stale bread with butter, and milk.

DR. HAMILL asked whether Dr. Ostheimer was sure that all patients followed his directions and whether he knew the caloric value of the food that he was giving and the amount of fat, carbohydrate and protein. Otherwise the diets might or might not be correct. It had been Dr. Hamill's experience that many children were receiving an ill-balanced diet, for example, excessively high in protein. At times they were receiving food of a caloric value sufficient to sustain an adult. It should be remembered that at times it is as necessary to decrease the intake of food, or a certain variety of food, as it was to increase. High protein foods caused very nervous children.

DR. ROSTOW thought that the simplest kind of a diet should be prescribed for patients of the poor, inasmuch as more elaborate



diets would not be carried out. Dr. Rostow felt that the four crimes committed in infant feeding were: (1) Too much food. (2) Bad food. (3) Too little food. (4) Too frequent feeding. The last was most important.

DR. HAMILL said it was not necessary at all for the mothers to be told anything about fat, carbohydrate, protein or calories. It was necessary, however, for the physician to understand these things in order to feed intelligently. It was not a difficult matter for one to calculate dietaries, especially by using some such tables as those of Locke.

DR. BRADLEY said that from studies which he had formerly made he was convinced that artificial feeding was not necessary until after the sixteenth month. He was interested in the dietaries of children in several institutions and he believed that these diets should all be studied carefully and that one should know their caloric value.

DR. HILL spoke of the studies of Dr. Pritchard, of London, and of his theory that rickets was a disease of overfeeding.

DR. OSTHEIMER, in closing the discussion, mentioned the fact that his cases were very closely followed by a competent social service. He had estimated the calories from time to time on several of these patients. None of these children had developed rickets and those who had rickets were not made worse. Besides the feeding of these babies, their general condition, exercise, etc., were carefully watched. The great majority have done remarkably well.

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TYPES OF PNEUMOCOCCUS FOUND IN THE PNEUMONIAS OF INFANTS AND YOUNG CHILDREN.—In a series of 50 cases of pneumonia in young children studied by M. Wollstein and A. W. Benson (*American Journal Diseases of Children*, 1916, Vol. XII., p. 254) the comparative frequency (60 per cent.) of type 4 pneumococcus was noticeable, as was also the high mortality (40 per cent.) rate it caused. Pneumococci of types 1 and 2 were present in a higher percentage of lobar pneumonias than of bronchopneumonias; the mortality rate of the cases in which type 1 was found reached 83 per cent., and type 2 was fatal in 33 per cent. of the cases in which it occurred. All these figures are much higher than in lobar pneumonia cases in adults, and the greater mortality of type 1 over type 2 is also to be noted. —*The American Journal of Obstetrics*.

## MEDICAL PROGRESS

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### A CLINICAL CLASSIFICATION OF HEART DISEASE AS USED AT ST. LUKE'S HOSPITAL, NEW YORK

BY WILLIAM P. ST. LAWRENCE, M.D.

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Early in the organization of a cardiac class for children at St. Luke's Hospital, the need for a classification of heart disease became imperative. It was found that even among physicians it was difficult, in a short description, to convey the quality or type of heart intended. It was also found that nurses and social workers had no means of differentiating mild from severe cases and that there was no way for them to use judgment in the application of energy as to kind and amount. To them it was just heart disease. For these reasons as well as the desire to systematize our work I have devised this classification.

In so much as almost all diseases of the heart in children result from the so-called rheumatic infections it seemed wise to gather these cases from which the cardiacs were recruited into one large group to be known as potential cardiacs. In this way such efforts at prevention as were possible might be applied at the time and place where they were of greatest value. When hearts were actually involved, the procedures varied with the efficiency. When valves alone were affected, the heart as a unit was invariably high in efficiency and impairment of its function became evident only with muscular involvement. Consequently valve lesions without muscular involvement represented the first degree. Cases in which the heart muscle was *slightly* involved but was efficient, in other words compensating, represented the second degree, and differed greatly in clinical picture and needs from those cases where the muscle was badly damaged, that is, decompensating. The stage of decompensation represented the third degree. The frequency with which the disease passes through these various stages makes the word degree particularly adaptable.

## CLASSIFICATION

POTENTIAL CARDIACS: All cases of rheumatism and the allied rheumatic infections.

*First Degree:* Valvular lesion without demonstrable evidence of muscular involvement. No symptoms, past or present, referable to heart.

*Second Degree:* Valvular lesions with muscular involvement and mild symptoms of cardiac distress. The compensating heart.

*Third Degree:* Valvular lesions with marked muscular involvement and well-defined symptoms of cardiac decompensation.

POTENTIAL CARDIAC CASES: Acute Rheumatism. Recurrent Tonsillitis. Chorea. Growing Pains and Rheumatic Myositis. Hearts showing Hemic or Functional Murmurs.

*First Degree Cases:* Physical signs of valvular lesion. No pathological arrhythmia. No abnormal pulse elevation on exertion. No dyspnea on exertion. No edema. No cardiac embarrassment in the flat dorsal position.

*Second Degree:* Physical signs of valvular lesion. Mild pathological arrhythmia (diphtheria). Abnormal pulse elevation on exertion. Mild cough or dyspnea on exertion or in the flat dorsal position. The compensating heart.

*Third Degree:* The usual well-defined symptoms and signs of marked cardiac decompensation.

There has been no difficulty in applying this classification to cases of congenital as well as acquired diseases. Experience has proved this classification to cover the ground completely. It has met all indications and has completely included all cases. It has been in use in the children's cardiac class at St. Luke's Hospital for over a year and has proved of invaluable assistance. Further division seemed to make the scheme unnecessarily complicated. Lesions of syphilitic origin have not appeared among our cases and because of their rarity, if existence at all, this disease has not been included in the potential group. In applying this scheme to adults the same principle can be used and syphilitic cases can be readily included.

A further communication will appear later in the ARCHIVES concerning the aims and organization of the children's heart class, including the details of its administration.

310 West Eighty-Sixth Street.

## DEPARTMENT OF ABSTRACTS

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### ORIGINAL CONDENSATIONS OF CURRENT PEDIATRIC LITERATURE BY THE EDITORS AND THE FOLLOWING ASSOCIATES

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BREWER, GEORGE E.: SOME OBSERVATIONS ON CONGENITAL AND ACQUIRED HEMOLYTIC ICTERUS, WITH A REPORT OF TWO CASES TREATED BY SPLENECTOMY. (Medical Record, July 1, 1916, p. 91.)

Three types of the group of disease associated with splenomegaly having a number of features in common have been written much about.

The first, described by Banti, is that in which there is a primary enlargement of the spleen without symptoms, often for a period of years followed by a progressively increasing anemia of the chloritic type, with gastric symptoms; still later with cirrhosis of the liver and its accompanying symptoms.

The second is that of splenomegaly associated with grave and progressive anemia, which presents the characteristic blood changes of pernicious anemia.

In the third type, the chief symptom is jaundice. It is congenital or acquired and an exceedingly chronic condition. The jaundice is due to a too rapid destruction of the blood cells and is a true hemolytic icterus.

Cases are frequently encountered in which the three types seem to be combined. In all three there are splenomegaly, excessive hemolysis, anemia and pigmentation, so that it is still a question but that one is dealing with a single pathological entity with variations in its symptomatology.

In congenital cases of the splenomegaly hemolytic icterus, the jaundice appears soon after birth. At first it is only a slight sallowness or yellow discoloration of the sclerotics. As a rule,



there are no other symptoms and the child may reach adolescence with only a slight impairment of health. The degree of anemia is often in direct proportion to the degree of jaundice. The disease has a tendency to appear in several members of the same family. Grafe reports a family of 13 children. Chauffard and Widal advanced the theory that the hemolyzing agents were present or at least primarily active in the blood, and that the disease was a true blood disease; but most observers now hold to the opinion that the seat of the disease is the spleen. This is based upon the marked structural changes in this organ, the evidences of excessive hemolysis in the spleen with the presence of a great excess of pigment granules, showing the iron reaction, in the tissues of the spleen, in the sinus and tributaries of the splenic vein and the demonstrated curative affect of splenectomy.

Elliot and Kannavil reported 48 splenectomies with 2 deaths. Of these, 9 were reported cured more than six months after the operation.

From these cases the author believes that splenectomy is comparatively safe and the only successful method yet suggested in the treatment of splenomegalic hemolytic jaundice. He reports 2 cases of his own in which after operation both patients were free from jaundice, much improved in health, and able to do their work without fatigue.

CHARLES E. FARR.

EISENDRATH, DANIEL N.: UNDESCENDED TESTES. (*Annals of Surgery*, September, 1916, p. 324.)

No single theory, the author believes, will explain all the cases of undescended testes, and in all probability a combination of causes is present. Budinger thinks that fixation by adhesions due to a fetal peritonitis is the cause. A short mesorchium or peritoneal fold suspending the testis, which prevents the organ from migrating, is the cause assigned by others.

In the majority of the author's cases there has been a great deficiency in the development of the arching fibers of the internal oblique muscles and a weak conjoined tendon.

The testis may be arrested in its normal course or may deviate from its normal course. The gubernaculum testis is like a four-tailed ribbon; one tail is attached over the pubic region, one over Scarpa's triangle, the third to the perineum, and the fourth extends to the lowermost part of the scrotum. Normally the scrotal tail is supposed to pull the testis downward. If the testis

is pulled in the direction of the other tails, obviously there is a deviation in its course and abnormal descent or ectopia occurs. Usually every case of arrested testis is accompanied by an inguinal hernia of the indirect variety.

Complications of non-descent of the testis are: (1) Marked atrophy of the secretory function of the retained testis, (2) inflammation, (3) torsion of the cord, (4) and tumor formation. Hypopituitarism is an independent and frequent complicating condition.

The author believes that if the testis is within the inguinal canal or just beyond the external ring and cannot be brought well down into the scrotum, the operation should be done at as early an age as is compatible. In adults the prognosis as to a possible recovery of the spermatogenesis is not very good.

The author gives the steps of the modified Bevan operation for repair as follows: The inguinal canal is opened in the same manner as in a typical operation for hernia. The sac, testis and vessels are first freed from the surrounding tissues and the gubernaculum testis isolated and divided. With fine blunt instruments the vas and the spermatic veins are carefully separated from the sac, if possible without opening the sac. The sac is then opened, its contents reduced and it divided at a level just above the proximal end of the testis. The distal portion of the sac is now everted around the testis and its edges united with catgut to prevent the occurrence of a hydrocele. After the vas and vessels have been separated as high up in the iliac fossa as possible, the proximal portion of the sac is ligated. The testis is now held in the lowest portion of the scrotum and a catgut purse-string suture inserted through all the structures at the external ring. The cord lies behind this suture, which thus holds the testis and cord in the scrotum without any compression of the vas or vessels. The inguinal canal is then repaired as for a hernia without transplanting the cord.

CHARLES E. FARR.

MITCHELL, A. GRAEME: TYPES OF PNEUMOCOCCI IN INFANTS AND CHILDREN. (*The Pennsylvania Medical Journal*, February, 1917, p. 343.)

The following conclusions are reached: (1) The so-called fixed types of pneumococci are of infrequent occurrence in infants and children as compared with adults. Of 90 children, 11.1 per cent. showed Type I.; 11.1 per cent. showed Type II.;

and 3.3 per cent. showed Type III. (2) The pneumococci without definite agglutination reactions, and classed as Type IV., are of more frequent occurrence in infants and children than in adults; 74.4 per cent. of 90 children showed Type IV. pneumococci. (3) The mortality of infants and children infected with the fixed types (I., II., III.) seems to be lower than in adults. Of 87 children none infected with Type I. died; 20 per cent. infected with Type II. died, and 33.3 per cent. infected with Type III. died. Infants and children infected with Type IV. have a slightly higher mortality (10.9 per cent.) than adults. The number of cases presented is rather small to draw definite conclusions concerning the mortality of the different types, inasmuch as relatively few cases were infected with Types I., II. and III. (4) The fixed types occur at all ages from six months to eleven years. (5) Type IV. pneumococcus often causes as severe an infection as the fixed types. Type I. seems to cause a mild infection. (6) Type IV. is the most frequent infecting organism in bronchopneumonia, although the fixed types may also be found. Of 11 cases of bronchopneumonia, 10 were caused by Type IV. pneumococci, and 1 by a Type I. pneumococcus. (7) Complications are more frequent with Type IV. infection. Of 90 children, all the severe complications (empyema and meningitis) were in those infected with Type IV. pneumococcus. HAROLD R. MIXSELL.

MACAUSLAND, W. R.: ASTRAGALECTOMY IN INFANTILE PARALYSIS. (*Journal of the American Medical Association*, January 27, 1917, p. 239.)

It seems to the writer that with the possible exception of one or two conditions in the paralyzed foot, transplantation should be discarded in favor of a procedure which gives permanent results. It is the failure to recognize that weakness, disability and deformity of the foot follow paralysis of one group of muscles as frequently as they follow paralysis of all the muscles, that tempts the surgeon to use insufficient means as transplantation and silk ligaments for the deformity. Surgical interference is not indicated for at least one and one-half to two years after the initial attack and not until longer if the age of six or seven has not been reached.

The author has used astragalectomy as devised by Royal Whitman in almost all of the deformities following infantile paralysis affecting the leg. In his series of 100 cases he is convinced of

its superiority over transplantation, silk ligaments and allied operations, as it gives more stability and preserves sufficient motion. Its benefit is most striking in calcaneovalgus.

In the operation, a curved or right angle incision is made around the external malleolus, tending forward over the head of the astragalus. The upper flap of the tissues is dissected upward, exposing the tendons of the peroneus longus and brevis, which are severed at the fibular tip and the ends retracted with No. 2 catgut sutures. An incision is then made through the external ligament around the astragalus. The foot is strongly inverted, the astragalus pried out of position head first and removed. The internal lateral ligament is dissected upward from the internal malleolus, a small piece is excised from the side of the scaphoid and cuboid to form pockets for the malleoli. The foot is then displaced backward and held carefully in this position to insure the proper relation in the new joint. A moderate equinovalgus gives stability. The peronei are disposed of by suture to the Achilles tendon. After closing the skin, plaster is applied from the toes to mid thigh with knee flexed, and the foot in equinovalgus. The leg is elevated for ten days. The cast is changed in about four weeks and the equinus corrected to a right angle. A leather shoe is put over the plaster and the child allowed to walk. The results obtained by astragalectomy have led the author to discard all other procedures except in rare cases.

CHARLES E. FARR.

BLOOM, CHARLES J.: EIGHTEEN MONTHS' OBSERVATION ON THE MENTAL AND PHYSICAL STATE OF CHILDREN FOLLOWING THE REMOVAL OF TONSILS AND ADENOIDS. (*New Orleans Medical and Surgical Journal*, April, 1917, p. 695.)

Dr. Bloom reaches the following conclusions: (1) Children exhibiting some alterations in the normal histology of tonsils and adenoids give marked evidences of mental retardment. (2) Rheumatism, syphilis and tuberculosis from hereditary and environmental points of view have but little significance as causative agents of diseased tonsils and adenoids. (3) This series of 57 cases did not exhibit the pathological entities attributable to tonsils and adenoids, namely, endocarditis, myocarditis, rheumatic fever, chorea, etc. (4) In all there were 29 causes for the removal of these glands—the marked improvement was evidenced only in cases where (a) persistent sore throat and tonsillitis with



temperature; (b) frequent colds; (c) frequent attacks of suppurative otitis media; (d) mouth breather and suppurative lymph nodes were the factors of their removal. (5) Adenoidectomies should always be practiced where the child is a mouth breather before the tonsils are enucleated. (6) The largest tonsils (by weight) were those removed from patients who previously had measles and scarlet fever; the smallest from children who had mumps and whooping-cough prior to operation. (7) Only 1 child gave a history of pneumonia before the tonsils and adenoids were removed. (8) No relation between abnormal and diseased teeth on the one hand and glands on the other. (9) *Weight Status*—The weight curve showed appreciable improvement after ten years of age; gains were noted between six and ten years, inappreciable before this time. Children with diseased tonsils are practically all underweight, namely 3 per cent. to 26 per cent. (10) Gratifying results were obtained in 90 per cent. of 40 cases where reports and statement were secured and especially marked in cases where frequent colds, tonsillitis (with temperature), and mouth breather, were the factors for their removal. (11) Frequent temperature traced to the tonsils and adenoids should be the indication for immediate removal after the acute symptoms have subsided, despite the fact that the child might be between the age of twelve to twenty-four months, respectively; on the other hand, if there is no temperature but the patient suffers from symptoms attributable to tonsils and adenoids, do not remove these organs until the child reaches the age of six years.

HAROLD R. MIXSELL.

MIXTER, C. G.: UNDESCENDED TESTICLE IN CHILDREN. (Boston Medical and Surgical Journal, November 2, 1916, p. 631.)

The normal descent of the testicle into the scrotum during the eighth month is described by the author. If the testicle fails to descend the process vaginalis does not become obliterated by fusion of its surfaces, hence an undescended testicle is accompanied by a congenital hernia. In remedying this defect, it is easier to obtain sufficient length of the vas to permit the testicle to rest easily in the scrotum than to get the necessary elongation of the spermatic vessels.

Of the thirty operations in the past three years in the Children's Hospital, the late results of the operation were obtained in 26 cases. There was atrophy in 8 cases following operation.

Age apparently was not a factor in these cases. Of the 7 reported cases in which the vessels were completely divided, every instance showed a marked atrophy of the testicle. In the 3 cases of bilateral undescended testicles there was atrophy in every case on the side in which the vessels were cut, while the other side left intact the testicle developed normally.

The author uses the usual hernia incision, completely stripping the four or five spermatic trunks in the inguinal canal free from the vas, cremasteric muscle and fibrous tissue. The vas is freed from the peritoneum where it turns downward and backward into the pelvis, which usually sufficiently lengthens the vas.

If the vessels still prevent the testicle from lying without tension, gentle traction on the testicle will show which of these trunks are under strain, and one or two may be tied and cut. To hold the testicle in position during the closure a temporary suture is passed through the bottom of the scrotum. The author believes that purse-string sutures around the upper part of the scrotum are unnecessary for this purpose. Preferably the operation should be performed any time after three years.

The author concludes that the testicle in childhood requires free circulation for normal development. When partial resection of the spermatic vessels is necessary, atrophy may or may not occur, complete section of the spermatic vessels has been invariably followed by atrophy, the blood supply of the artery of the vas being insufficient to nourish the developing testicle.

CHARLES E. FARR.

KELLEY, EUGENE R.: THE QUANTITATIVE RELATIONSHIP OF MILK-BORNE INFECTION IN THE TRANSMISSION OF HUMAN COMMUNICABLE DISEASES. (The Journal of the American Medical Association, December 30, 1916, p. 1997.)

Dr. Kelley draws the following conclusions: From this statistical study, although it is incomplete in several respects, many interesting and suggestive deductions can be made. Analysis of Massachusetts investigations does not corroborate the statements to be found in various places in recent literature, alleging that milk is a very important channel of infection in a quantitative sense in this group of diseases. Massachusetts experience would seem to indicate that even in raw milk supplies, with widely varying conditions of supervision, diphtheria transmission through milk is so rare an occurrence as to be negligible. The transmis-

sion of scarlet fever through milk, while much more common than diphtheria, is of very small percentage significance. Typhoid fever in this large series, extending over a period of years, was reasonably attributed to milk infection in a much larger number of cases than diphtheria or scarlet fever, but these amounted in all to only 5 per cent. of the total cases of typhoid reported, a very different story from the statements of from 10 to 25 per cent. frequency of typhoid infection by milk that can be found in various places in recent public health literature. Septic sore throat is par excellence the milk-borne disease, but its occurrence is fortunately relatively rare; when it does occur, it is nearly always an epidemic form and is of more serious consequences. In all probability the menace of tuberculosis is the best justification that we have as practical sanitarians for the amount of propaganda that has been carried on and the money that has been expended by health authorities for the supervision and control of milk supplies, so far as such supervision aims at the suppression of communicable diseases. HAROLD R. MIXSELL.

ALLEN, J.: APPENDICITIS COMPLICATING PNEUMONIA. (The British Journal of Children's Diseases, July, 1916, p. 207.)

The author believes that appendicitis in children is more common than is generally supposed, as many so-called gastric attacks in children are appendicular in nature. Early operation at this period of life is especially indicated.

He reports a case of a girl, eleven years of age, admitted to the hospital with acute abdominal symptoms and with a diagnosis of appendicitis. The illness began six days before with sickness and vomiting. The abdominal symptoms appeared to be more severe in the lower right quadrant of the abdomen. The temperature was  $105.2^{\circ}$ , with no cough nor any pain in the chest. On operation, the appendix was found to be inflamed and upon opening it a blood clot was found to be inside. The vessels in the appendix were thrombosed, and there were several thread worms lying within the cavity. The appearance of the appendix suggested progressive inflammation.

On the day after the operation, a troublesome cough developed. The lung showed signs of consolidation at each base. The patient subsequently had a typical and unmistakable crisis, which occurred on the eighth day of the disease.

The case appears to the author to be a secondary pneumo-



coccal infection of the appendix, following an atypical pneumonia—atypical in so far as no physical signs were present until late in the disease. He concludes that it should be remembered that pneumococcal infection of the lungs may exist for days without the occurrence of demonstrable physical signs and in not a few cases the infection may run its entire course without going into consolidation.

CHARLES E. FARR.

FRANK, IRA.: NONDIABETIC ACIDOSIS, WITH SPECIAL REFERENCE TO POSTOPERATIVE ACIDOSIS IN CHILDREN. (*Annals of Otology, Rhinology and Laryngology*, December, 1916, p. 917.)

That acidosis follows frequently operation for adenoids and tonsils is due to the fact that these operations are more often done on children than any other class. Anesthesia is the most common cause involving, as it does the starving prior to operation, the destruction of tissue due to the fat-dissolving quality of ether and also the chronically infected tonsils have an important bearing on the production of acidosis. Children under twelve years of age never fail to show acetone in the urine in the twenty-four hours following a general anesthetic. The first clue to an impending acidosis following an anesthetic is found in the pulse record. When the pulse rate remains high or lowers only slightly from the rate during the anesthesia and in the absence of shock or hemorrhage, during the first hours following an operation, acetone in the urine will always be found in marked quantity. In the majority of cases this is the only symptom shown and the cases usually return to normal in a few days.

In a second group a persistent high pulse rate is complicated in from four to eighteen hours by the appearance of languor and drowsiness which may approach stupor; there is the "fruity" odor to the breath, the face may be slightly cyanotic and the tongue coated. There is usually little effort to arouse themselves except to ask for water.

In a third group, about 2 per cent., a more severe type occurs. This is shown by rapid pulse, stupor, vomiting everything, prostration, sometimes delirium and even coma. This shows a severe intoxication.

Treatment is based on (a) combating the abnormal physiological processes that are known to produce the symptoms and (b) symptomatic control. Under (a) we must supply the carbohydrate which we know is lacking under acid intoxication and



glucose has been widely used for this purpose either by stomach or by intravenous injection. Sodium bicarbonate is a good supplement to this or may be used alone in the milder cases.

Under prophylaxis the routine examination of urine prior to operation, the use of candy the day before and a minimum of the anesthetic with a short operation are to be considered.

SAMUEL W. THURBER.

HOLINGER, J.: ON DIAGNOSIS AND OPERATION OF SINUS THROMBOSIS. (*Annals of Otology, Rhinology and Laryngology*, December, 1916, p. 985.)

The peculiarities of sinus thrombosis are contrasted with infections of the middle ear, where the process is limited by bone and the exchange of blood and lymph is limited by narrow channels, and infections in the nose and throat, where the parts are well supplied with blood, there is room for great swelling and secretion and drainage is very free; in both these few metastases occur. In sinus thrombosis large emboli in the lungs are frequent and metastases in other parts of the body often lead to suppuration; the occurrence of these phenomena give rise to chills and high fever, often of but short duration, but coming on without warning and when the child may be apparently doing well in the course of an otitis.

The following conclusions are drawn: The diagnosis is made from septic attacks. Four or five chills may be observed without danger to the patient and it is not necessary to operate even after the second attack. In uncomplicated inflammations of the middle ear the temperature does not rise above  $102^{\circ}$ , so that when we note rises to  $104^{\circ}$  or  $105^{\circ}$  we know the process has gone beyond that cavity. Other mastoid symptoms may or may not be present.

The author cites 4 cases in children: The first one had a septic embolus in the right knee; the second one an extradural abscess on the right side; the third one developed pneumonia following an operation for cleft palate and later had a mastoid infection with thrombosis; the fourth one developed an extradural abscess following mastoiditis. All recovered after operation.

SAMUEL W. THURBER.

## BOOK REVIEW

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THE GROWTH OF MEDICINE FROM THE EARLIEST TIMES TO ABOUT 1800. By ALBERT H. BUCK, B.A., M.D., Formerly Clinical Professor of Diseases of the Ear, Columbia University, New York; Consulting Aural Surgeon, New York Eye and Ear Infirmary; Etc. New Haven: Yale University Press. London: Humphrey Milford. Oxford: University Press. 1917.

The reviewer has always felt the lack of a course of medical history in his medical education. As far as he can ascertain there is no medical school in this country which *does* supply such a course. Perhaps this is due to the fact that so much practical work must be jammed into four short years and there is no time for what might be considered an extraneous subject. However this may be, the fact remains that medical educators are beginning to realize more and more the necessity of augmenting the purely practical work with the historical work which has gone before. It is by reading of the triumphs and failures of our great predecessors that we *can* and *do* learn. The great difficulty up to the present has been the lack of a book in English which would fill this need. Dr. Buck's book, in our opinion, is a much-needed and timely production. He freely draws from the histories of Neuburger and Haeser, and in so doing boils down, simplifies, and in a most entertaining manner traces the growth of medicine from prehistoric times to 1800. For those who are still in medical school the book will prove worthy to be used as either a text or a reference book. For those who are in the midst of a busy practice it will take the place of a novel or a magazine, so engrossing it is, and will round out our medical knowledge in a most surprising manner. The book itself is a fine example of the bookbinder's art and contains 582 pages and 28 figures and illustrations. To cite a few of these might be of interest: The oldest known pictorial representation of a formal dissection of the human body (dating from 1400 A.D.); consultation by three physicians upon a case of wound in the chest; barber surgeon extracting an arrow from a wounded soldier's chest while the battle is still in progress; Pierre Francos forceps for crushing calculi in the urinary bladder; forceps devised by Ambroise Paré; the manner in which the so-called Tagliacotian operation for repairing a defective nose should be carried out; concealed lithotome invented by Frère Côme in 1748. This book will unquestionably take its place as a classic on medical history.

# ARCHIVES OF PEDIATRICS

MAY, 1917

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PUBLISHED MONTHLY BY E. B. TREAT & CO., 241-243 WEST 23D STREET, NEW YORK

## ORIGINAL COMMUNICATIONS

### THE MORBIDITY AND MORTALITY OF PERTUSSIS AND MEASLES, WITH PARTICULAR REFERENCE TO AGE \*

By BORDEN S. VEEDER, M.D.

St. Louis, Mo.

Before taking up each disease separately it is of interest to note the position occupied by measles and pertussis in relation to the chief causes of mortality in infancy and childhood. In Chart I. the percentage of deaths from different causes (74 per cent. of the total) to the total number of deaths in children under two years (infancy) and in children under ten years is graphically shown. With the exception of accidents, birth injuries and

\* Chairman's address, read before the Section on Pediatrics at the Seventh Annual Meeting of the American Association for Study and Prevention of Infant Mortality, Milwaukee, October 19, 1916.—From the Department of Pediatrics, Washington, University Medical School.

congenital malformations, these represent the chief causes of deaths at this period of life. The great preponderance of deaths due to diarrhea and enteritis, premature birth and congenital debility (marasmus, atrophy, etc.) result in 65.7 per cent. of all of the deaths under ten years occurring in the first year of life and about 80 per cent. in the first two years. The percentage distribution of deaths in the first ten years of life is shown in the small insert in Chart I.

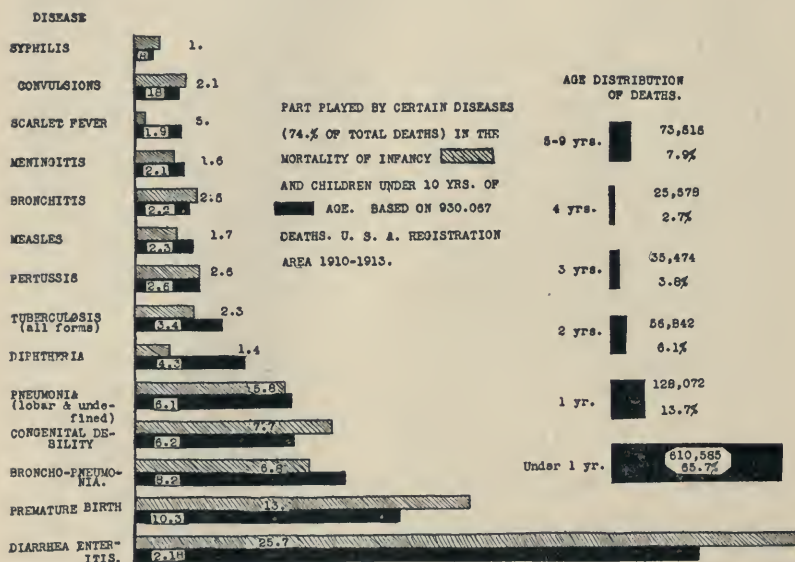


CHART I. Part played by certain diseases (74% of total deaths) in the mortality of infants and children under 10 years of age. Based on 930,067 deaths. U. S. Registration Area 1910-1913.

In Chart II. the curve of each disease is plotted by year periods up to five years, and for the five-to-nine-year period. This Chart shows the relative position of the different diseases as a cause of death at each age period. As there is such a preponderance of deaths in the first year of life the absolute number of deaths from a given cause may be very much larger in the first than in any succeeding year, but its relative position may be lower.

Although it will be seen that measles and pertussis together form but 5 per cent. of the total mortality under ten years and 4.3 per cent. of the mortality of infancy, Chart III. shows why these diseases may be regarded as suitable for discussion by this society. In Chart III. the age distribution of the deaths from



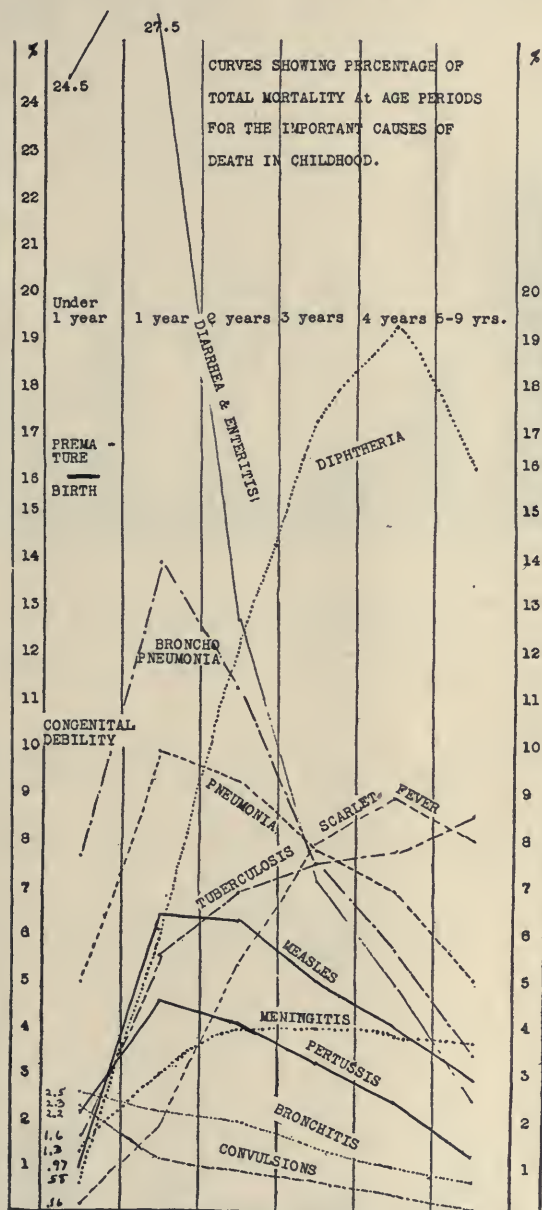


CHART II. Curves showing percentage of total mortality at age periods for the important causes of deaths in childhood.

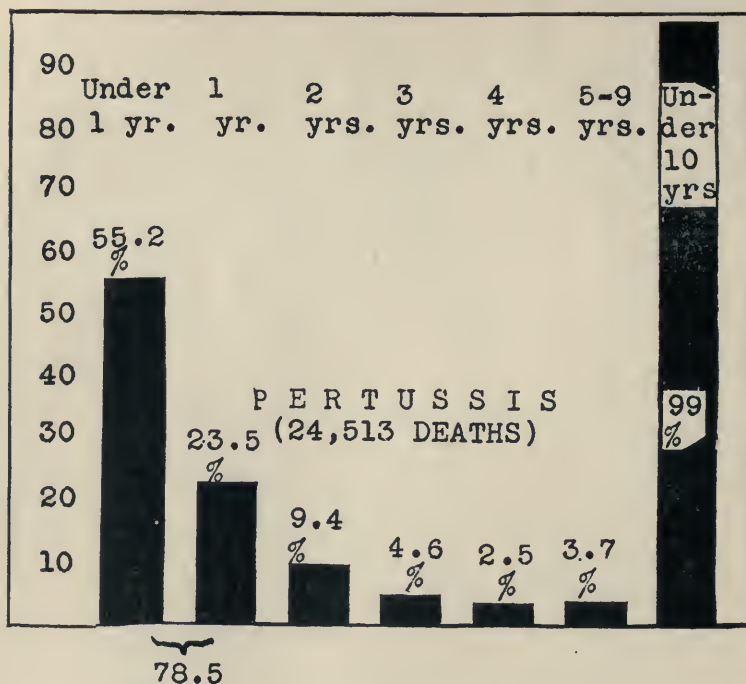


CHART IIIA. Distribution of deaths by age.—Pertussis  
U. S. Registration Area 1910-1913

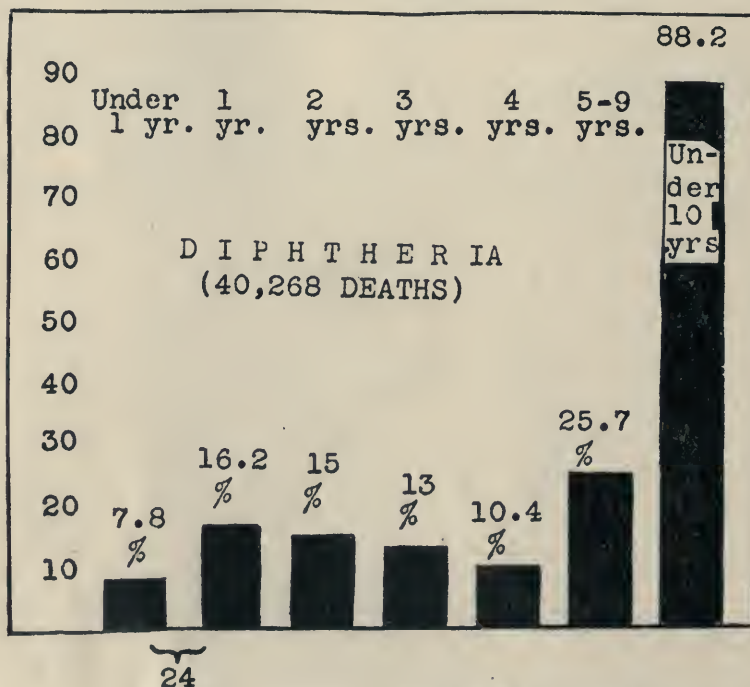


CHART IIIC. Distribution of deaths by age.—Diphtheria  
U. S. Registration Area 1910-1913

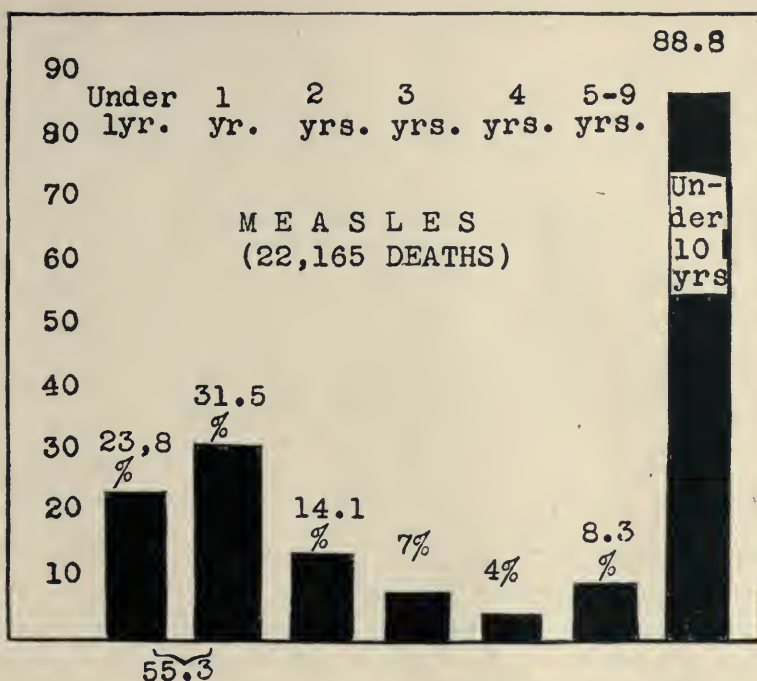


CHART IIIB. Distribution of deaths by age.—Measles  
U. S. Registration Area 1910-1913

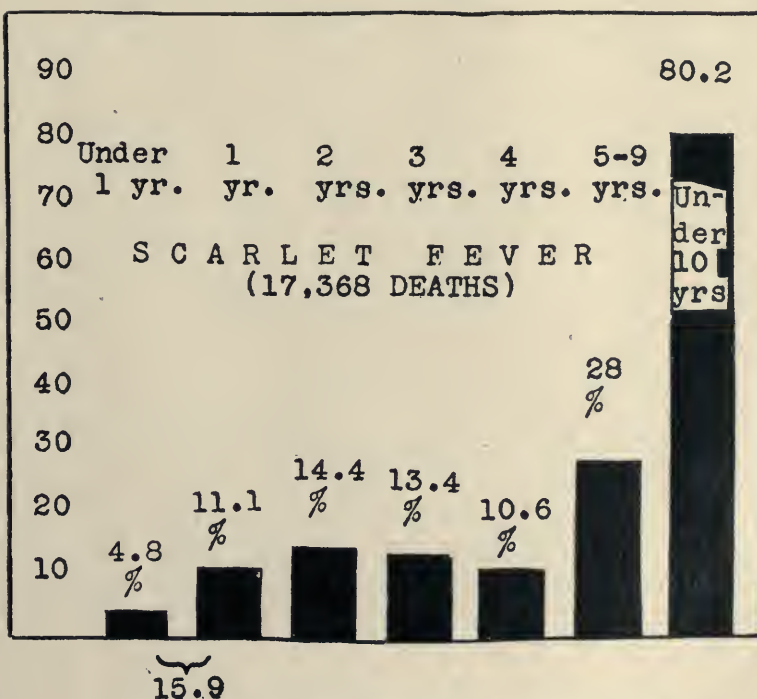


CHART IIID. Distribution of deaths by age.—Scarlet Fever  
U. S. Registration Area 1910-1913

these diseases is shown. Over one-half (55.2 per cent.) of the deaths from pertussis occur in infants under one year, and over three-quarters (78.5 per cent.) under two years. The mortality of measles is not so largely confined to infancy but nearly one-quarter (23.8 per cent.) occurs in the first year of life and, as the result of the high death rate (31.5 per cent.) for measles in the second year, over half of the deaths (55.3 per cent.) in infants under two. These two diseases are in marked contrast to the two other contagious diseases of childhood which have an appreciable mortality and hence similar charts for diphtheria and scarlet fever are given for purposes of comparison.

*Morbidity of Pertussis*—Morbidity reports and statistics are very unsatisfactory. In many states and communities notification is of recent date and not compulsory for many diseases, and even when supposedly compulsory is very imperfectly carried out. This is due to a number of causes among which may be mentioned the lack of interest of some physicians who do not appreciate its importance, lack of power to enforce notification, questionable diagnosis, and the fact that many cases are never seen by physicians unless the child becomes extremely ill. At the present time measles is a notifiable disease in 38 of our 52 states and territories and pertussis in 36,<sup>1</sup> but the percentage of unreported cases is unknown. Examination of the Public Health Service records shows a marked fluctuation above and below the mean fatality rate that cannot be accounted for by differences in the virulence of epidemics alone, but the high fatality rate for certain states is much more reasonably accounted for by poor notification. So no reliable data for the frequency of pertussis as a whole are available. Luttinger<sup>2</sup> in a recent survey in New York found that only 10 to 15 per cent. of the cases of pertussis were reported. We know the attack rate is less than for measles but that under certain conditions—as in institutions—it may attack a very high percentage of susceptibles. In some of the larger cities notification is perhaps more thoroughly carried out and the following figures showing the number of cases per 1,000 of population are taken from the records of their Health Departments. St. Louis—1914, 1.9; 1915, 1.9; Philadelphia—1913, 0.9; 1914, 2.5. In Table I. the number of cases and the attack rate per 1,000 of population is shown for a five-year period for Washington, D. C.



TABLE I.

SHOWING THE NUMBER OF CASES AND ATTACK-RATE PER 1,000 OF  
POPULATION FOR PERTUSSIS

WASHINGTON, D. C., 1908-1912

Age	Population	Cases	Rate
Under 1 year .....	27,415	486	17.7
“ 5 years .....	133,255	2,213	18.1
“ 10 “ .....	259,760	3,578	13.7
All ages .....	1,652,870	3,846	2.4

TABLE II.

SHOWING THE DISTRIBUTION OF THE CASES OF PERTUSSIS BY AGE,  
AND THE FATALITY-RATE FOR EACH AGE PERIOD

ABERDEEN, SCOTLAND, 1891-1900 (LAING AND HAY)

Age	Cases	Percentage	Deaths	Fatality Rate per 100 Cases
Under 1 year .....	2,492	16.5	313	12.5
1 “ .....	2,327	15.4	235	10.1
2 years .....	2,297	15.2	76	3.3
3 “ .....	2,129	14.1	48	2.2
4 “ .....	1,808	11.9	30	1.6
5 “ .....	1,676	11.1	9	.5
6 “ .....	1,163	7.7	8	.7
7 “ .....	584	3.9	1	.2
8 “ .....	266	1.7	1	.4
9 “ .....	114	.7	0	..
10 “ .....	237	1.5	1	.4

With poor notification figures it is difficult to more than approximately show the age incidence of the disease or of the case fatality rate. In Table II. the age distribution and the fatality rate by age as given by Laing and Hay<sup>3</sup> for Aberdeen, Scotland, is shown. According to these figures the yearly incidence for the first four years is nearly the same, but the number of deaths per 100 cases decreases very rapidly after the second year.

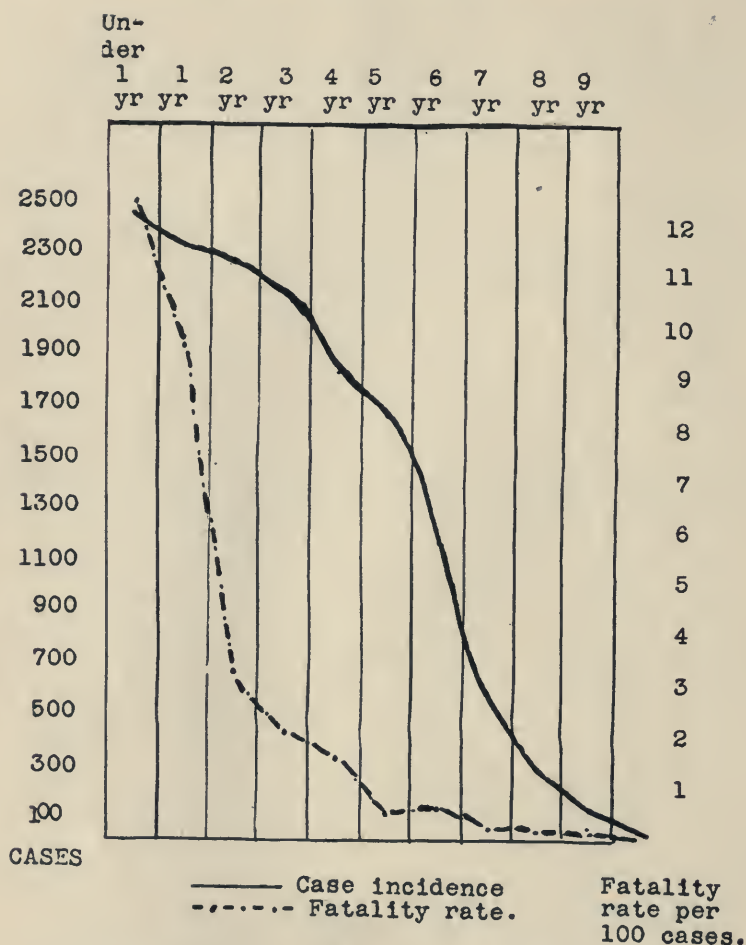


CHART IVA. Number of cases of pertussis and fatality by age.  
Aberdeen, 1891-1900.

This is shown graphically in Chart IV. The case-fatality rate in infancy—between 10 and 12 per cent.—is high in our opinion and one cannot but question the reporting of all cases. A smaller series of cases from Budapest gives a higher age incidence for infancy (45 per cent. of the total) than the Aberdeen statistics. In Table III. the age incidence for 10,000 cases collected by Luttinger in New York is given. About 40 per cent. occurred in infancy.

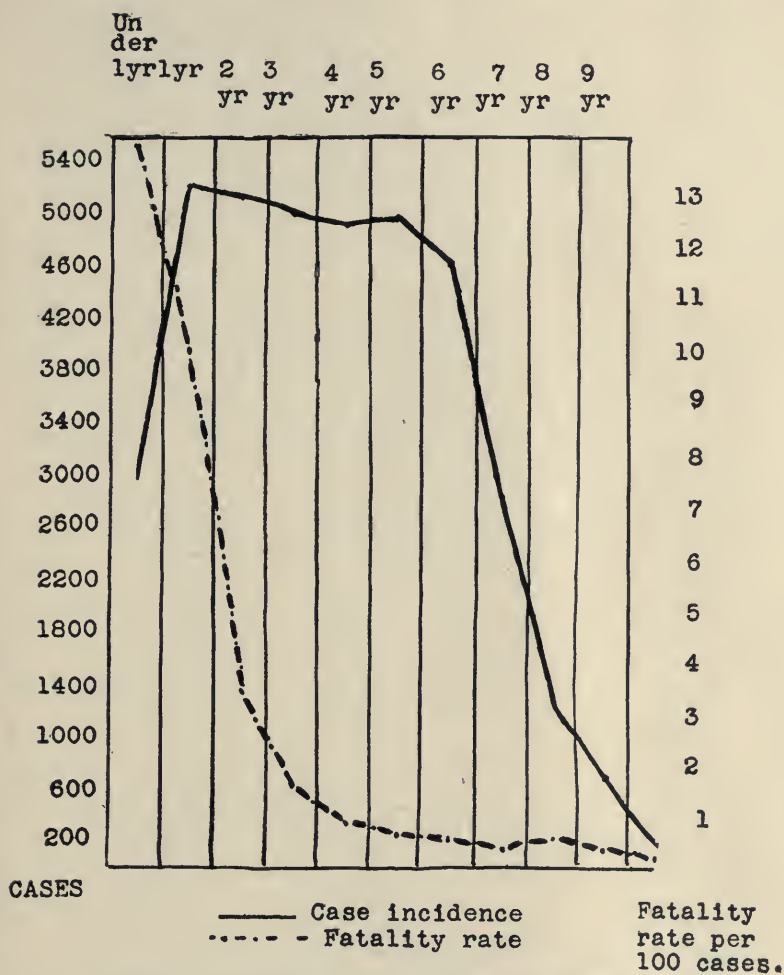


CHART IVB. Number of cases of measles and fatality by age.  
Aberdeen, 1883-1902.

TABLE III.

SHOWING AGE DISTRIBUTION OF 10,000 CASES IN NEW YORK CITY

Age	Cases	Percentage
Under 1 year	1,904	19.4
1 "	2,019	20.2
2- 5 years	4,010	40.1
5-15 "	1,799	17.9
Over 15 "	232	2.3

*Mortality of Pertussis\**—According to Crum<sup>4</sup> 1 per cent. of the grand total of deaths is due to pertussis—a figure based on the mortality records for 24 countries over a five-year period and representing a population of nearly two billions. The annual average death rate is 8 per 100,000 of population. Crum's extensive study covers a number of factors as differences in death rate due to sex, race, season, and climate, which cannot be considered within the limits of this paper.

TABLE IV.

SHOWING THE ANNUAL DEATH RATE FROM PERTUSSIS FOR THE REGISTRATION AREA FOR THE YEARS 1904-1913, THE PERCENTAGE OF THE TOTAL POPULATION IN THE REGISTRATION AREA, AND BASED UPON THIS, THE NUMBER OF YEARLY DEATHS FROM PERTUSSIS IN THE UNITED STATES

Year	Death Rate per 100,000 in Registration Area	Percentage of Population in Registration Area	Number of Deaths in Total Population
1904	6.5	40.4	5,369
1905	10.6	40.4	8,926
1906	15.1	48.9	12,961
1907	11.3	49.2	9,882
1908	10.6	52.5	9,444
1909	9.6	56.1	8,706
1910	11.4	58.3	10,525
1911	11.3	63.1	10,614
1912	9.3	63.2	8,886
1913	10.0	65.1	9,716
Average . . . . .	10.5	53.7	9,502

In Table IV. the yearly death rate from pertussis for the ten-year period—1904-1913—for the registration area of the United States is shown and based upon this rate the total number of deaths for the entire continental United States. Naturally such a calculated figure is only approximate, as it is based upon the actual figures for only 53.7 per cent. of the total population. But we can safely say that during this ten-year period between 90,000

\* In the preparation of this paper the mortality statistics of the United States Census Bureau for the registration area have been utilized to a large extent. Considerable care has been taken in recent years in classifying deaths and we can regard these figures as accurate as any available. It may be that some deaths classified with pneumonia and bronchopneumonia belong to the measles and pertussis groups, although where these are given in death reports as the cause of death complicating measles or pertussis, the latter are used in classifying the deaths. It is reasonable to regard any error as leading to too few deaths being charged against these diseases.



and 100,000 deaths from pertussis occurred in the United States, or that each year over 90,000 children die of such a "mild and uninteresting" disease as whooping-cough. The annual average death rate for these ten years is 10.5 per 100,000 of population with fluctuations of from 6.5 in 1904 to 15.1 in 1906. In the last few years the death rate has been more constant. As the average death rate for the last four of the ten years is 10.5, or the same as for the entire ten, the deaths in these four years have been used in computing the remaining tables.

TABLE V.

SHOWING THE AGE DISTRIBUTION OF 24,779 DEATHS FROM PERTUSSIS

UNITED STATES REGISTRATION AREA, 1910-1913

Age	Deaths	Percentage	
Under 1 year	13,675	55.2	} Infancy 78.7
1 "	5,829	23.5	
2 years	2,332	9.4	
3 "	1,141	4.6	
4 "	617	2.5	
5-9 "	919	3.7	
Under 10 "	24,513	98.9	
Over 10 "	266	1.1	

TABLE VI.

SHOWING THE PERCENTAGE OF PERTUSSIS DEATHS TO THE TOTAL MORTALITY AT DIFFERENT AGES. FIGURES ARE YEARLY AVERAGE OF THE TOTAL ANNUAL AND PERTUSSIS DEATHS FOR REGISTRATION AREA, 1910-1913

Age	Total Deaths for Age	Deaths due to Pertussis	Percentage of Mortality due to Pertussis
Under 1 year	152,646	3,419	2.21
1 "	32,018	1,457	4.55
2 years	14,210	583	4.10
3 "	8,868	285	3.23
4 "	6,394	154	2.40
Under 5 "	214,142	5,898	2.75
5-9 "	18,379	230	1.25
Under 10 "	232,521	6,128	2.60

What is of particular interest to the student of infant mortality is the age distribution of the deaths from pertussis. In Table V. the 24,779 deaths from this cause in the registration area for

the four years are subdivided according to the age at which death occurred, and this is graphically shown in Chart III.

The part played by pertussis in the mortality of each age period in childhood is shown in Table VI. and the curve is plotted in Chart II. The figure is obtained by dividing the number of deaths from pertussis for a given age by the total mortality for that age. We find that while 55 per cent. of the pertussis deaths occur in the first year of life and 23 per cent. in the second, pertussis is twice as big a factor in the mortality of the second year as it is in the first. This is due to the mortality of the first year of life being some five times that of the second.

TABLE VII.

ONE THOUSAND FATAL CASES OF WHOOPING-COUGH, SHOWING  
PRIMARY COMPLICATIONS

PRUDENTIAL INDUSTRIAL MORTALITY EXPERIENCE, 1911-1913

Complications	Number of Deaths	Per Cent. Distribution
Bronchopneumonia .....	286	28.6
Pneumonia .....	270	27.0
Bronchitis .....	56	5.6
Other respiratory diseases .....	15	1.5
Meningitis .....	44	4.4
Cerebral congestion .....	9	0.9
Heart complications .....	25	2.5
Digestive complications .....	79	7.9
Nephritis .....	8	0.8
Dysentery .....	6	0.6
Tuberculosis of lungs .....	9	0.9
Miscellaneous .....	45	4.5
No complications .....	148	14.8
Total .....	1,000	100.0

There are many other points in regard to the mortality of pertussis which cannot be discussed in this paper, but in closing the discussion of pertussis I wish to present part of a table (Table VII.) from Crum showing the primary complications of pertussis based upon 1,000 cases from the mortality experience of the Prudential Insurance Company, as the data are most interesting and instructive.

*Morbidity of Measles*—The data are more extensive for the morbidity of measles, and may be considered as more reliable than the pertussis data. We know that measles is perhaps the most highly infectious of the communicable diseases, and that a very high percentage of susceptibles is attacked. The incidence in a given district or area varies according to the number of non-immune at a given time, hence wide variation is found in statistics for the attack-rate. This periodicity of the morbidity and sequentially of the mortality is well known, and is illustrated very prettily by Chart V. taken from Paul Müller,<sup>5</sup> which is based on the morbidity statistics of fourteen European cities, and shows

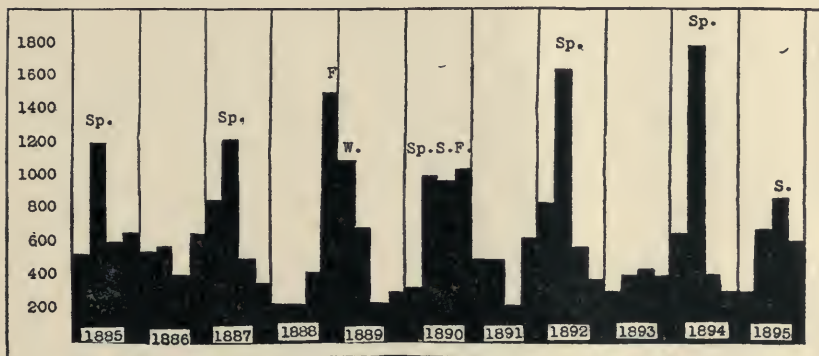


CHART V. Showing wavelike periodicity of measles; 7 epidemics in 11 years. Based on measles morbidity in 14 European cities (after P. Th. Müller), Sp.—Spring; S.—Summer; F.—Fall.

seven wavelike epidemics occurring over a space of eleven years. Some charts of Crum show this periodicity for American cities. Because of this epidemic character of the incidence it is difficult to estimate the attack-rate. It is known that in certain epidemics eighty and more per cent. of the susceptibles have acquired the disease.

In Table VIII. the age incidence and fatality rate for different ages in childhood is shown for over 43,000 cases in Aberdeen, Scotland. This table shows that the cases of measles are very evenly distributed throughout early childhood (after the first year of life) but that the case fatality-rate shows a rapid fall after the first year. This is shown graphically in Chart IV. where a comparison with pertussis may be made. The incidence curves for age differ somewhat but the case fatality curves are strikingly similar.

The case fatality rate for the entire group of cases shown in Table VIII. is 3.3 per 100 which is somewhat high. In the three years, 1912-13-14, there were 471,742 cases of measles and 8,331 deaths reported in 33 states, which gives a case fatality rate of 1.76 per 100 cases. The fatality rate varied in these states from 0.23 per 100 cases in Nevada (434 cases, 1 death) to 7.35 in Rhode Island 816 cases—60 deaths<sup>6</sup>).

TABLE VIII.

SHOWING THE DISTRIBUTION OF MEASLES BY AGE AND THE FATALITY RATE FOR EACH AGE PERIOD

ABERDEEN, SCOTLAND, 1883-1902 (CRUM)

(Compare with Table II. for Pertussis)

	Age	Cases	Percentage	Deaths	Fatality Rate per 100 Cases
Under	1 year . . . . .	3,034	7.5	426	14.0
	1 " . . . . .	5,222	12.9	526	10.0
	2 years . . . . .	5,195	12.8	178	3.4
	3 " . . . . .	5,053	12.5	82	1.6
	4 " . . . . .	4,786	11.8	43	.9
	5 " . . . . .	5,352	13.3	35	.7
	6 " . . . . .	4,628	11.5	21	.5
	7 " . . . . .	2,818	7.0	14	.5
	8 " . . . . .	1,258	3.1	5	.4
	9 " . . . . .	672	1.6	4	.6
Over	10 " . . . . .	2,206	5.5	12	.5
		40,224	100.0	1,346	3.3

*Mortality of Measles*—According to figures collected by Crum,<sup>7</sup> measles causes slightly more than 1 per cent. of all deaths in the temperate zone (366,262 in a total of 33,626,651 deaths in 22 countries in the five-year period 1906-1910). The percentage of measles deaths varies considerably in different countries—that for the United States in recent years being between 0.7 and 0.8 per cent. of the total deaths.

In Table IX. the mortality rate per 100,000 of population from measles for the registration area of the United States is shown for the years 1904-1913, and based upon this the approximate number of deaths in the United States during this ten-year



period. The average annual death rate from measles for these ten years was 10.2 per 100,000 of population, or approximately the same as that for pertussis, hence we can say that on an average over nine thousand deaths occur annually from measles in the United States. Because of the periodicity of the disease the mortality per 100,000 of population differs markedly in the same area in different years, in different communities in the same year, and in the yearly death rate. Thus in one year there may be twice as many deaths from measles as in another, as occurred in the years 1912-1913 for example, but the ten-year average gives a fairly accurate index of the mortality rate.

TABLE IX.

SHOWING THE ANNUAL DEATH RATE FROM MEASLES FOR THE REGISTRATION AREA FOR THE YEARS 1904-1913, THE PERCENTAGE OF THE TOTAL POPULATION IN THE REGISTRATION AREA, AND BASED UPON THIS THE NUMBER OF YEARLY DEATHS FROM MEASLES IN THE UNITED STATES

Year	Death Rate per 100,000 in Registration Area	Percentage of Population in Registration Area	Number of Deaths in Total Population
1904	11.0	40.4	9,086
1905	7.5	40.4	6,316
1906	12.1	48.9	10,386
1907	10.0	49.2	8,745
1908	9.9	52.5	8,818
1909	9.6	56.1	8,706
1910	12.3	58.3	11,334
1911	10.0	63.1	9,392
1912	7.0	63.2	6,688
1913	12.8	65.1	12,437
Average . . . . .	10.2	53.7	9,210

That these deaths are largely confined to childhood is shown in Table X. in which the distribution by age of over twenty thousand deaths from measles in the United States is tabulated. It shows that 80 per cent. of the measles deaths occur in early childhood (under five years) and over half (55.3 per cent.) in infancy. The age distribution of deaths is shown graphically in Chart III.

The percentage of the total deaths at different age periods due to measles is shown in Table XI. It will be seen that measles

reaches both its absolute and relative height as a mortality factor in the second year of life. In pertussis the absolute height occurs under one year, but the relative height in the second year.

TABLE X.

SHOWING THE AGE DISTRIBUTION OF 24,936 DEATHS FROM MEASLES

UNITED STATES REGISTRATION AREA, 1910-1913			
Age	Deaths	Percentage	
Under 1 year .....	5,940	23.8	} 55.3
1 " .....	7,865	31.5	
2 years .....	3,527	14.1	
3 " .....	1,752	7.0	
4 " .....	998	4.0	
5-9 " .....	2,078	8.3	
Under 10 " .....	22,165	88.8	
Over 10 " .....	2,771	11.2	

In measles as in pertussis complications of the respiratory tract form the chief factor in the mortality. From 60 to 80 per cent.—depending upon the season of the year—of the primary complications of measles are respiratory in nature. Institutional life, it is well known, tends to increase markedly the case fatality rate. Thus Holt reports that in 300 cases in two institutional epidemics among children under three years, some 40 per cent. developed pneumonia and 70 per cent. of these died. Overcrowding is also a contributory factor to a high mortality rate as has been shown by studies in Glasgow, among immigrants by Wilson, and by the high incidence and mortality among soldiers in barracks. Many other factors as sex, climate, season, housing, race, etc., which are of interest in connection with the morbidity and mortality of measles are necessarily omitted in this paper.

*Summary*—A study of the morbidity and mortality of measles and pertussis brings out certain factors. Perhaps the most important of these is that, on an average, between 9,000 and 10,000 deaths from each disease take place annually in the United States. While the death rate as a whole, and for certain diseases as tuberculosis, diphtheria, diarrhea and enteritis under two years, and typhoid fever, shows a decrease in the registration area in the past fifteen years, that for measles and pertussis has remained practically the same. Surely no disease that causes 1

in every 100 deaths, or that rolls up an annual toll of between nine and ten thousand lives a year is insignificant or unimportant.

A second point is found in the age distribution of the deaths in these two conditions. Nearly 80 per cent. of the pertussis and over half of the measles deaths occur in infants. The older the child the lower the case fatality rate. The widespread impression among the laity that it is a good thing to have these common infections of childhood early and get them over with is erroneous. The longer they can be warded off, so much less the chance of fatal or damaging complications.

TABLE XI.

SHOWING THE PERCENTAGE OF MEASLES DEATHS TO THE TOTAL MORTALITY AT DIFFERENT AGES. FIGURES ARE YEARLY AVERAGE OF THE TOTAL ANNUAL AND MEASLES DEATHS FOR REGISTRATION AREA, 1910-1913

Age	Total Deaths for Age	Deaths due to Measles	Percentage of Mortality due to Measles
Under 1 year .....	152,646	1,485	0.97
1 " .....	32,018	1,966	6.14
2 years .....	14,210	882	6.13
3 " .....	8,868	438	4.90
4 " .....	6,394	250	3.90
Under 5 " .....	214,142	5,021	2.30
5-9 " .....	18,319	520	2.80
Under 10 " .....	232,521	5,541	2.40

The mortality of the first year of life is greater than the combined mortality of the rest of childhood. A part of this—birth accidents—congenital malformations, etc.—may be termed fixed and is irreducible, but far the larger part is preventable to a certain extent. Somewhere between 5 and 10 per cent. of the mortality which may be lessened is due to measles and pertussis. It is the hope of the Committee for the Pediatric Section that the discussion to-night may arouse some interest in these ever-present and much-neglected diseases.

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## MULTIPLE CARTILAGINOUS EXOSTOSES \*

WITH A DISCUSSION OF THE PATHOLOGY AND A CASE REPORT

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Multiple cartilaginous exostoses is the usual term applied to that condition which is characterized pathologically, first, by a chondrodysplasia affecting especially the metaphyses of the long bones; and, second, by the formation of cartilaginous and osteo-cartilaginous exostoses arising from groups or islands of cartilage cells, situated subperiosteally and apparently left behind from the epiphyseal cartilages in the growth and development of the bone; and clinically, first, by the occurrence of these pathological lesions in multiple and more or less symmetrical arrangement; second, by the usual occurrence in addition of certain typical skeletal deformities; and third, by the fact that the condition is found frequently to be hereditary, and occasionally to be congenital.

Ehrenfried has recently written two excellent theses on this subject, the first<sup>1</sup> being a careful description of the condition, the second<sup>2</sup> a compilation of the cases appearing in American literature. He has collected 29 cases that were formally reported, and 42 additional cases mentioned in discussions or as affected relatives, a total of 71 cases. He, himself, reported 10 new cases, making a list of 81 cases. To these may be added the following:

Montgomery<sup>3</sup> in 1916 reported 5 cases occurring in three generations of a family. The first case was a seventy-one-year-old man, whose parents had come to Canada from Germany and were healthy. Three of his children, a man and two women, and a grandson, the adult son of one of the women, comprised the other 4 cases reported, and Roertgenogram confirmation of the diagnosis is given in 3 of the 5 cases. Of the other 2, 1 died, and the other refused to exhibit herself.

Hamann<sup>4</sup> in 1916 reported 1 case, a man of twenty-two years, with multiple exostoses, of which one was removed for study, a careful microscopical description being appended to the report. "Careful inquiry failed to reveal a similar condition in any relative."

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More or less definite indication of the present or past existence of other cases in America may be obtained from the following items. Percy, in discussion following Vaughan's paper,<sup>5</sup> stated that he had just operated on a case. Rotch<sup>6</sup> gives Roentgenograms of 2 cases, both five-year-old boys, one of which, however, may have been Ehrenfried's Case 7. A photograph accompanying the present paper (Fig. 1) shows two of a group of bones with lesions characteristic of this disease, and now in the pathological museum of the Washington University Medical School. The facts concerning this case are not known.

The case, the detailed report of which is the principal object of this paper, a second case, the patient's mother and reported in much less detail, and a third case, a sister to be mentioned, bring the total number of cases reported in American literature up to 45, and the cases mentioned as affected relatives, or in discussions, or whose past existence is indicated by bones or Roentgenograms, up to 48, a total of 93. It is probable that these numbers will quickly grow during the next few years as attention is more and more drawn to the definiteness of the clinical and pathological pictures, and the ease with which the condition can be recognized.

**PATHOLOGY**—The microscopical pathology of the lesions of multiple cartilaginous exostoses has apparently to do with two processes—first, the pathological growth of the epiphyseal cartilages and the resulting abnormality of the metaphyses; and, second, the presence, and course of growth, of islands of cartilage beneath the periosteum, usually over the metaphyses. Carmen and Fisher<sup>7</sup> note that there was present in their case, "both central



FIG. 1—Showing multiple exostoses in a tibia and fibula with union of the two bones at each end. The specimen is from a group of similarly affected bones, comprising an incomplete skeleton, in the Pathological Museum of the Washington University Medical School.

and peripheral involvement, the former manifesting itself as a very general diffuse enlargement of the long bones, the latter as typical exostoses arising from the cortex of practically all



FIG. 2—THE MOTHER'S RIGHT SHOULDER

Showing marked involvement of the upper six inches of the right humerus.

the long bones," and Ehrenfried, in defining the condition, speaks of "growths within and on the skeletal system." The Roentgenograms accompanying the present paper show quite clearly the pathological metaphyses, such as the distal end of the mother's right ulna (Fig. 4), also the spurs resulting from the overgrowth of subperiosteal islands of cartilage, such as the spur which was removed from the boy's left femur, and, in addition, numerous locations where it appears as though both processes were present, such as at the upper end of the mother's right humerus (Fig. 2).

Müller,<sup>8</sup> in an exhaustive study of the subject, gives draw-

ings of sections that show small islands of cartilage cells within the periosteum, and he makes the following conclusions:

"First—In the microscopical examination of cases of hereditary multiple cartilaginous exostoses there were found, as the first beginnings of the exostoses, islands of cartilage in the periosteum of the long and short tubular bones, the flat bones, and the clavicle, and in the periosteum of the entire bone surface, the same being found in marked multiplicity. The often-maintained origin of the cartilaginous exostoses from unossified remains of epiphyseal cartilage could not be proved in our case, although here the epiphyseal ends were favored as usual by the exostoses.

"Second—On the foundation of these islands of cartilage occur processes of calcification and ossification with the transformation of *ecchondroses* into cartilaginous exostoses. In the ossification of these cartilage islands is seen a similar irregular grouping of cartilage and bone layers as in epiphyseal ossification of rachitic bones. Cartilaginous ground substance and cartilage cells become, by metaplasia, bone substance and bone corpuscles.

"Third—The origin of the multiple cartilaginous exostoses lies in a constitutional anomaly of perichondrium and periosteum—that is to say, the anomaly expresses itself in an abnormal ability of the perichondrium of the cartilaginous portion

of the ribs and of the osteogenetic layer of the periosteum of bones that have been laid down in cartilage, to form cartilage during the entire growth period and even longer."



FIG. 3—PART OF THE MOTHER'S  
LEFT HUMERUS

In this bone the upper six inches are involved, but not so markedly as in the right humerus. The spur on the posterior medial aspect was very prominent clinically.

The exostosis, the histology of which is described in the case report in the present paper, is apparently due to such an island of cartilage which grew peripherally, and laid down bone behind it, the spur when sectioned showing first the new bone, then a layer of cartilage, and then the periosteum or perichondrium. And in this periosteum itself are found three definite islands of cartilage presumably similar to the original island which caused the growth of this spur. (Fig. 8.)

But this metaplasia of subperiosteal islands of cartilage does not explain the conditions in the epiphyseal cartilages and in the metaphyses. Here is apparently a different process, though one undoubtedly closely related to the other, and typified by the following description of a section cut from an affected epiphysis by Ehrenfried.<sup>9</sup> "There is a slight thickening of the periosteum, and while there is a very active osteogenetic layer, the cortical bone is very thin. In the periosteum just above the epiphyseal line is an area of young cartilage increasing the thickness of periosteum four or five times. The epiphyseal tissue is greatly disarranged; the columns of cartilage cells are very irregular; there is a distinct and irregular increase in the cartilaginous tissue, and the cells in this proliferated cartilage are quite irregular in grouping. Irregular splotches of calcification are present in this cartilage. In some of the lacunæ the bone is laid down. This tissue gives the impression of tumor in the nature of a chondroma. This, a typical excessive growth of cartilage, of course, will account for the enlargement, and the imperfect osteogenesis for the porosity of the epiphyseal ends. The ectopic cartilage is apparently a subsidiary feature."

The last sentence alludes to the theory of the origin of the exostoses, the more or less accepted one at present, that these osteocartilaginous exostoses arise from subperiosteal islands of cartilage that are left behind from the epiphyses in the course of growth of the bone, and that both the mother cartilage of the epiphysis and its offshoots, the cartilage islands, are composed of tissue which is abnormal, and which develops into similarly abnormal bone. Müller apparently favors the theory of a constitutional anomaly of the perichondrium and the periosteum, resulting in their ability to form cartilage which in turn forms the exostoses, but he does not recognize the pathological state of the epiphyseal cartilages.

By means of the Roentgen ray and Ehrenfried's section, it



seems clear that there is excessive growth of cartilage at the epiphyses with irregular and faulty ossification. A result of this is the irregularly rarefied and cystic appearance that is found in Roentgenograms, particularly of the distal metaphysis of the radius and ulna, and the proximal metaphysis of the fibula. It is easily conceivable that in the process of growth of a long bone, one or more small portions or islands of cartilaginous tissue might become separated from the rest of the epiphyseal cartilage



Right

FIG. 4—THE MOTHER'S WRISTS

Left

Besides showing abnormal bone within and upon each radius and ulna, this plate reveals involvement of the distal metaphysis of each first and fifth metacarpal bone, and possibly of each unciform. The relative shortening of each ulna is also shown as well as some curving of the radii.

by the irregular ossification that is known to be present. This theory is well borne out by the section of an exostosis described and pictured in this paper. (Fig. 8.)

#### CLINICAL DESCRIPTION

From the nature of its pathology, it is evident that the lesions of multiple cartilaginous exostoses arise and grow during the so-called bone-formative period, that is, intrauterine and up to the age of about twenty-two. After that time they rarely progress further unless some malignant complication sets in,

which happens, however, in about 5 per cent. of the cases.<sup>1</sup> The lesions are multiple, and more or less symmetrically distributed, usually appearing most noticeably at the wrists, knees and shoulders. Any bone that is laid down in cartilage may be involved, but the epiphyses and metaphyses are usually the only parts of the bone to become affected.

Certain secondary characteristics are usually, but not always, present, such as a relative shortening of the ulna in comparison to the radius with a resulting finlike displacement of the hand to the ulnar side of the wrist, and often with more or less compensatory bowing of the radius. A similar relative shortening of the fibula may cause pes valgus, but the tibia usually remains straight. The mid-point of height is frequently elevated above the symphysis pubes—a practically constant finding if looked for, Ehrenfried believes—the explanation being that all the extremities and in particular the legs, show relative shortening. Joint ankylosis is rarely, if ever, met, but parallel bones such as a tibia and a fibula may become joined by bony union at one or both ends. Premature ossification of the epiphyseal cartilages is also frequently demonstrated by the Roentgenograms, while usually the epiphyses appear small and misshapen, and the intermediary cartilage narrow, irregular and oblique or zigzag.

The growth of the exostoses is unaccompanied by symptoms except those due to mechanical reasons, and these may be entirely absent. In fact the presence of the condition is often discovered only by chance, and when the lesions are already well marked. Probably many more cases would be found were the disease accompanied by some definite symptom, such as pain. As it is, a definite history of other cases in the family can be elicited in the majority of instances. The disease is transmitted by both males and females, even by unaffected women, and occurs nearly three times as often in males as in females. Montgomery<sup>3</sup> notes that the lower animals are subject to a similar condition.

#### CASE REPORT

Patient, B. A., No. 10,718, age nine and one-half years, was admitted to the St. Louis Children's Hospital for observation and study because of abnormalities in his long bones, convulsions and eye trouble.

*Family History*—The father came from a family of stout people, and was born in Ohio. He died of cancer of the mouth

sixteen months ago. The mother was born in Illinois. Three of her family died of pulmonary tuberculosis, but the last such death was several years before the patient's birth. She knows of no bony abnormalities in her husband's family, nor in her own connections, except in herself and one daughter, and the patient. She is fifty-three years old, usually of good health, rather small and slender. She states that she had pains resembling rheumatism in her arms when ten or eleven years of age, and that she has noticed that her wrists were both misshapen for a number of years, but she does not know how long. She has also noticed hard prominences on each upper arm, but she feels sure that her leg bones are not similarly involved. In fact, she has noted no other bone abnormalities, nor any impairment of motion of her limbs. Complete physical examination could not be obtained, but each wrist was found to show definite evidence of bone anomaly, and there could be felt a hard prominence on the medial aspect of the center of the left humerus, also one on the lateral aspect of the right



FIG. 5. PHOTOGRAPH OF THE PATIENT Showing a fairly characteristic attitude, also the deformities especially about the knees. Above and medial to the left patella can be seen the prominence caused by the spur which was removed for section.

humerus at the insertion of the right deltoid muscle. Roentgenograms were made of these bones showing lesions similar to those of the patient. (Figs. 2, 3 and 4.) Palpation of the knees and ankles failed to reveal anything abnormal.

The mother has been pregnant five times. Her first child, a boy, died of inflammatory rheumatism at nine years of age. The second, a girl, born five years later, is now stout and well, and the mother of several children. Her wrists are slightly but definitely abnormal in shape, due to bone changes, but she feels sure that none of her other bones are affected, and that none of her children have any evidences of this trouble. She seemed to be quite definitely a case of multiple cartilaginous exostoses, but, unfortunately, confirmatory Roentgenograms were not made. The third was a boy, born seven years later, always well. The fourth, a girl, was born two and one-half years later, and is well. Neither of these 2 children have any bone abnormalities. The fifth child, the present patient, was born eight and one-half years after the fourth, and when the mother was forty-four years of age. She has had no menses since the patient's birth. Her blood Wassermann test is negative.

*Past History*—The patient was a premature baby, having been born easily at seven months, but at a time when his mother was sick with "kidney trouble and vomiting." The baby weighed less than 3 pounds, looked "black," and was given up by the doctor. The first week he was fed practically entirely on diluted whiskey, but then was nursed, and was kept largely on the breast until two years old, by which time he had become fairly plump. As an infant, he seemed unusually weak, his head rolling all around. Strabismus was first noticed in infancy, but the eyes were kept closed most of the time. Later, the lids seemed to droop shut, but the patient could raise them. The mother thinks that this ptosis still persists somewhat, that the vision of each eye is normal when used alone, but that there is faulty vision due to the strabismus. She does not know if the boy sees double or not. The patient was slow in cutting his teeth, and all his teeth of both sets have been decayed from the start. He began to walk at two and three-quarter years and to talk at three.

During the first week of life he had several general convulsions, which also occurred quite frequently throughout the first year, diminished in frequency during the second year, became more frequent again during the third year, but since then



have become less frequent. The last convulsion was more than two months before admission. These convulsions all began suddenly, involved the whole body at once, were at first clonic, then tonic, and then the patient would relax into deep



FIG. 6—THE BOY'S RIGHT HUMERUS .

On the medial aspect of the shaft about three inches from the shoulder can be felt the comparatively large exostosis which is so prominent in the illustration. The Roentgenogram reveals the outline of the entire upper third of this bone as irregular and atypical, while the lower two-thirds appears to be normal in this view.

sleep, the whole lasting from twenty minutes to an hour. Occasionally, he would vomit, and this seemed to abort the attack, so that the mother often tried to induce vomiting when an attack had started. Nobody else in the family, near or distant, ever had similar convulsions. The patient has also had indefinite little

"nervous spells," which have been relieved by some antispasm tablets. During his three months' stay in the hospital no convulsions were observed.

At the age of four he accidentally fell into hot water, burning both arms up to the elbow, so that the skin all came off. As a baby, he broke a little finger once, but there have been no other accidents such as broken or dislocated bones. He had measles about twenty months before admission, but otherwise has never had any definite illnesses. He has never complained of his arms or legs, or had other evidences of rheumatism, nor sore throat. His appetite is usually fickle, but has been better the last year or two. He is usually constipated, and occasionally uncomfortable in his abdomen from constipation. He does not vomit, except when it is induced during a convulsion. The mother thinks that the boy's mind is normal; says he is quick to learn, but is handicapped by faulty vision.

When four years old, that is, about the time when he was burned, it was first noticed that some of his bones showed abnormal shapes and contours. These lumps have become larger as he grows older, but only very slowly, and at no time has he had any pain in his bones. Also, there has been no noticeable loss of function in his extremities except that he has always lacked a tight grip in each hand.

*The Present Illness* reveals nothing acute, the boy being brought to the hospital for observation and study because of the bone abnormalities, the convulsions, and the eye trouble.

*Physical Examination*—The patient (Fig. 5) is a rather poorly nourished boy appearing to be about nine years of age. He carries himself with drooped and rounded shoulders, and holding his hands close to the lower part of his sternum. He is restless, his attention being easily attracted and as easily lost. His speech is rapid, jerky and blurred, and therefore difficult to understand. He is apparently not ill, and there is no fever, dyspnea, cyanosis nor cough. He is 122 cm. tall (48 inches), and therefore 8 cm. under the average height for his age.

Langer<sup>12</sup> divides the height into 1,000 units, and finds the following relationships between that part of the body above the upper border of the symphysis pubis and the part below:

	Age—14 days	3 years	7 years	10 years	Adult
Upper .....	619	574	505	502	494
Lower .....	381	426	495	498	506



Left

FIG. 7—THE BOY'S WRISTS AND HANDS

Right

The two joints seem to be normal on examination, but in the Roentgenogram the carpal bones in each wrist show the ossification of a six-year-old, although the patient is nine and a half. The metacarpals and phalanges show no marked abnormalities, but the proximal end of several of the proximal phalanges can be felt as rather abnormally prominent, and there is some interference with extension of the second phalangeal articulation of the third finger of each hand.

The right radius is moderately bowed, and fairly smooth throughout its extent except for the distal inch, where the appearance in the illustration suggests a subperiosteal overgrowth. Clinically, this is an easily palpable, marked, nodular enlargement. The right ulna is distinctly shortened with a resulting marked lateral flexion of the hand on the wrist. The lower third of the bone is palpably enlarged and irregular in outline, all suggesting a cystic or rarefying process in the bone itself. The shadow of the distal epiphysis is very faint, and measures only 4 x 2 mm.

In the shaft of the left radius, the lower two inches are uneven in outline with a spurlike formation about two inches from the distal end of the bone. In the plate, the left ulna appears shortened though not as markedly as the right one, but the lateral flexion of the hand at the wrist seems to be more marked than on the right side. The distal inch and a half of the bone are markedly irregular in outline, and the bone here appears to be rarefied, suggesting a cystic condition. The distal epiphysis measures 8 x 4 mm., and is at the stage of development of that of a normal child of about six years.

The midpoint is about 1 cm. above the upper border of the symphysis pubis. The head is average in size, and shows no abnormalities in contour, nor tenderness on any local pressure. The hair is of average amount, and dry, and grows well down onto the forehead. The eyelashes are long and thick, and there is no spasm or paralysis of the eyelids. There is a double convergent strabismus, outward rotation of each eye being very limited due to paresis of both external recti muscles. The pupils are equal, regular and active. The retinæ and optic discs are normal. The ears and nose are negative and show no discharge. Hearing is apparently normal. The lips and mucous membranes are of good color. The teeth are practically all in poor condition. The tongue is clean, protrudes in the midline, and shows no tremor. The tonsils are not enlarged and show no exudate, but the crypts are prominent.

*Neck*—The neck shows no abnormal glands, pulsations or rigidity.

*Thorax*—The chest is fairly symmetrical. Expansion is rather small in amount, but equal on the two sides. On palpation, there seems to be a uniform slight enlargement at each costochondral junction anteriorly, but this does not appear in the X-Ray plates which, however, seem to show some flattening of all the ribs posteriorly.

*The Lungs* reveal nothing abnormal in physical signs. A rather poor X-Ray plate seems to show a little blurring at the hilus of the right lung, but not enough to warrant the diagnosis of any pathological condition.

*The Heart* produces a diffuse wavy impulse, without abnormal heave, thrust or top, and the apex beat cannot be definitely localized. The area of relative cardiac dullness appears to extend about 1 cm. beyond the nipple line, and in the X-Ray plate, the heart appears to be enlarged slightly to the left, not only at the apex, but also at the base. Its action is slightly rapid, averaging around 100 beats a minute, but the rate is quite variable from time to time, and there usually is present a rather marked sinus arrhythmia. The heart sounds are of good force and quality, and no murmurs are heard at any time. The radial pulses are equal, and of good force and moderate tension.



*Abdomen*—The abdomen is scaphoid in shape, and reveals no tenderness, masses, or rigidity, except that in each lower quadrant can be felt rather soft masses which appear to be fecal in character. The liver, spleen and kidneys cannot be felt. Liver dullness extends from the fifth right interspace to the costal margin. There is no evidence of any hernia and the abdominal reflexes are present.

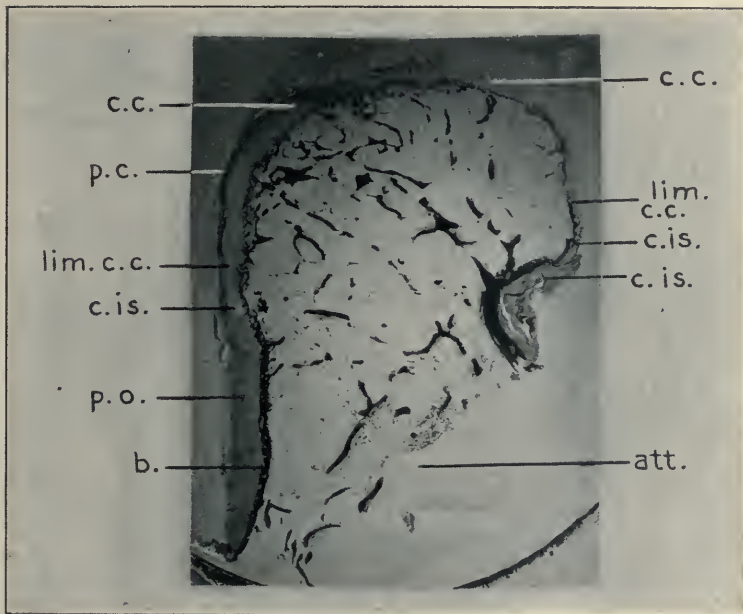


FIG. 8—SECTION OF AN EXOSTOSIS

Removed from the medial aspect of the distal metaphysis of the boy's left femur. p.o.—periosteum. p.c.—perichondrium. b.—bone. c.c.—cartilage cap. c.is.—cartilage islands in the periosteum. lim.c.c.—limits of the cap of cartilage. att.—line of recent attachment to the femur.

*Skin*—The skin generally shows no eruptions. On each arm below the elbow is a rather faint blotchy discoloration said to be due to the burn at the age of four.

*Skull*—The entire skull appears to be normal in shape and surface, and Roentgenograms taken on two occasions have failed to reveal any abnormalities. These have been looked for particularly with the thought in mind that some light might be thrown on the causation of the convulsions.

*Inferior Maxilla*—No abnormalities are found.

*Vertebrae*—No abnormalities are found, either in a careful examination or in the plates. The spine is straight.

*Clavicles*—In the plates the sternal ends of the clavicles do not appear clearly, and nothing abnormal appears in the rest of these two bones. However, examination reveals on the superior aspect of the sternal end of each bone, a distinct nodule projecting upward, easily visible as well as palpable.

*Scapulae*—The plates are of no value here. At the medial end of the spine of each scapula can be seen and felt a nodule, and a nodule can also be felt on the surface of each bone in the infraspinous region. The sites of the nodules on these bones are somewhat, but not exactly, symmetrical.

*Ribs*—The X-Rays reveal no exostoses on the ribs nor can any be made out on palpation. The sternal ends of all the ribs feel very slightly larger in diameter than the shafts of the ribs.

Further description of the bones is made in connection with the several Roentgenograms. Those portions of the shafts of the femora, tibiae and fibulae, which do not appear, show nothing abnormal either in the physical examination or in the plates.

*Musculature*—The muscular development of the arms is quite noticeably below that of the legs. The muscles in general feel soft, and there is a remarkable degree of hypotonia at the wrists and ankles, the extension of the wrists being 90 degrees, while the feet can assume to a marked degree either a varus or a valgus position. At the elbows and knees, however, there is a degree of spasm which prevents complete extension except by force. The resulting condition of "distal hypotonia" is quite marked.

The gait is somewhat one-sided and a bit uncertain, with a slight wobbling tendency which may be due to an attempted over-correction by the hypotonia at the ankles by his adductor muscles, the child holding his head towards the right. While walking, the boy holds his hands hyperextended, and close to the body, and at times a slight athetoid movement is seen.

*Reflexes*—The deep and superficial reflexes in both arms are slightly increased, and the knee-jerks are definitely increased. The ankle-jerks are present and lively, but the cremasteric

reflexes are not present. No ankle clonus could be obtained, and the Babinski was negative.

*Mentality*—A careful Binet-Simon test was done, but because of the patient's faulty vision it was necessarily incomplete. He passed four of the three-year tests, one being omitted because it required sight; three of the four-year tests, one omitted; two of the five-year tests, one omitted; two of the six-year tests, one omitted. The mental age accordingly was considered to be about five years. It was thought probable that this deficiency of four years was due to permanent mental subnormality rather than to the defective vision.

*Additional Findings*—A blood Wassermann test was negative. A von Pirquet and two intradermal tuberculin tests (1/100 mgm.) were all negative. Urinalyses were negative. The blood was normal.

*Specimen*—An osteochondrophyte from the medial aspect of the lower end of the left femur. (Fig. 8.)

*Operative Note* (in part): "It (the tumor mass) was about  $1\frac{1}{4}$  inches long, and about as large around as the end of a thumb. The growth was not nearly so pedunculated as the X-Ray indicated, the reason probably being that only the center of the mass was bone, the rest cartilage. The surface was perfectly smooth, much like the surface of a joint."

*Histological Description* by Dr. E. L. Opie: "The cartilage overlying the exostosis consists of a hyalin matrix which in some places is striated, and of cells which are more numerous in the deeper layers in contact with the bone. Here the cells occur in irregular groups with no tendency to formation of rows. At irregular intervals, upon the under surface of the cartilage, there is a layer of bone which in most places is scant, but elsewhere continuous with the trabeculae forming the exostosis. There are few osteoblasts over the surface of the bone, and an occasional osteoclast is seen, but there is little evidence of active bone absorption.

"The cartilage, when followed towards the base of the exostosis on both sides of the section, is found to disappear, the perichondrium becoming the periosteum. At the edge of the cartilage, projections occur, and in places islands of cartilage or occasionally one or more cartilage cells are isolated by sur-

rounding fibrous tissue. A short distance from the main mass of cartilage is a second small mass of similar character in contact upon its under surface with bone. On the opposite side of the exostosis are two very small isolated masses of cartilage which are completely surrounded by the fibrous tissue of the periosteum, and are in consequence completely separated from the underlying bone.

"Within the exostosis fat is abundant, and narrow cells are scant, but at the base of the exostosis groups of numerous marrow cells occur."

#### SUMMARY OF CASE REPORT

The patient is a nine and one-half-year-old boy who was prematurely born at the time of his mother's menopause, and following a severe nephritis during the last two months of her pregnancy. As an infant he was very weak, but after a year he appeared to be a fairly normal child except for epileptiform convulsions, which have occurred all his life, though only very infrequently of late. Irregularities in his bones were first noticed at the age of four, since when they have grown slowly and apparently become more numerous, finally involving all the long bones, the scapulæ, the clavicles and the ilii. His extremities also show a marked distal hypotonia. His mental age is apparently about five years, and the development of his carpal bones and some of his ossification centers about that of a six-year-old. A section of an exostosis is presented, as well as a number of Roentgenograms. The mother and an older sister also have multiple exostoses.

#### COMMENT

(1) Findings common to many of the cases reported in the literature are also noted in the case described herewith. The bones involved are those usually found so affected, and the lesions themselves are typical. Of the concomitant features, the mid-point of height is slightly elevated above the symphysis, concurring with Ehrenfried's findings that this is usually the case. Subluxation of the head of the radius due to relative shortening of the ulna is present in each elbow. Ashhurst<sup>10</sup> says that this occurs quite frequently. Premature ossification of the epiphyses is not made out, however, but, on the other hand, is found marked backwardness in the formation and growth of the carpal bones, as well as of some of the ossification centers.



(2) The hypothesis that the islands of cartilage, by a metaplasia of which the exostoses proper are formed, are left behind in the growth of abnormal epiphyseal cartilage, is apparently substantiated by the finding of an exactly similar condition in an exostosis itself. Here is a cartilage cap composed of cartilage cells in disarray and forming sparse bone beneath it, and barely outside the limits of this cap are found islands of cartilage in the periosteum, one of which is in immediate contact with new-forming bone. This seems precisely analogous to an epiphyseal cartilage with cells in disarray and forming sparse bone, while immediately adjacent thereto, being situated in the periosteum over the metaphysis, is an island of similar cartilage-forming bone in the shape of an exostosis. The conclusion seems therefore justified that the exostoses which characterize this clinical entity are due to the metaplasia of islands of cartilage which have been cut off from the epiphyseal cartilages and left behind in the periosteum.

(3) No light is thrown on the underlying or exciting causes of the metaplasia of the bone-forming cartilages. This point has yet to be cleared up.

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## INSTITUTIONAL CARE OF INFANTS\*

BY JULES M. BRADY, B.S., M.D.

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The wholesale condemnation of infant asylums, of which we have heard on so many sides, demands that the men who have been associated with the successful ones raise their voices in protestation. The most recent and most bitter denunciation of this system of caring for infants is by Chapin. He says that the plan of collecting babies in institutions should be abandoned as, on the whole, doing more harm than good. He believes that unsuccessful results are not so much due to lapses in care of details in management as to the system itself which fails because it is wrong. He makes a strong plea that all be abandoned. The boarding-out system in his opinion will work wonders. However, he gives no statistics from this method.

That infant mortality amongst the bottle fed is one of the burning questions of the day is common knowledge. But by no means can it be assumed that the path of the artificially-fed infant in the private home is strewn with roses. The mortality is tremendously influenced by the financial status of the parents.

Statements made in this article are based on an experience extending over twelve years at St. Ann's Infant Asylum of St. Louis; the service has been continuous day in and day out. This asylum is conducted by the Sisters of Charity and has in connection with it a large maternity hospital. From the tables following it will be seen that most of the infants are born in the institution. All infants are fed artificially; the maternity ward occupies one wing and is in charge of Dr. Swahlen. The building is new, being but twelve years old. The Sister in charge, Sister De Paul, is thoroughly in sympathy with every move to better our results. Coöperation is the watchword; like most institutions of its kind money is not any too plentiful. There are always present in the institution more babies than can be ideally cared for. This state of affairs is due to the desire of the Sisters to make the scope of their charity as extensive as possible. There are three wards for the infants, each in charge of a Sister who has been trained in the care of infants. There is also a milk laboratory, the conduction of

\* Read before the Central States Pediatric Society, St. Louis, Oct. 16, 1916.—  
From the Pediatric Department, St. Louis University.

which requires the entire time of a Sister. The infants are cared for by a corps of nursery maids who are in training and remain with us eighteen months. The large ward on the top floor of the building faces south and is really a sun-parlor, receiving air from all four sides. The population of this ward varies from 60 to 90 babies. Palpably there is an insufficiency of air space, but owing to the large number of windows the air can be readily changed. The other two wards on the east and west sides of the building care for on an average between 30 to 40 babies. The children are transferred downstairs to the runabouts between the second and third year. At the present time there are 54 children with the runabouts who have been transferred from the nurseries. This number would be larger but for the fact that a great many children are adopted between the first and second year. This statement will be interesting to those who claim it will be impossible for a baby to reach childhood in an asylum.

This asylum in its short history has witnessed a most remarkable change for the better. In 1912 at Atlantic City, before the A. M. A., I reported 170 babies cared for in the top ward with a mortality of 10.5 per cent. When I look back to the first few years of my assistantship at this institution and consider the method of feeding these infants and caring for gastrointestinal disturbances which were at that time endorsed by the leaders of our specialty, I do not wonder that the large majority of our infants died. But that is now ancient history, progress has been made.

Hess, working in a large Jewish Asylum of New York in the early part of the year, was able to report results extending over a period of five years which rivalled those obtained in private practice.

A mortality of 70, 60, 50 or 40 per cent. in an infant asylum is anachronistic and should bestir the authorities of such an institution to investigate the successful ones and see just what can be accomplished.

I would give it as my opinion that the men who are so profuse and sweeping with their expressions of condemnation should blame the faulty methods of feeding and caring for infants and not the institutions themselves. It is true that a certain percentage of infants have lived in private homes while infants were dying in institutions, but that was in spite of the way they were fed.

It is well known that tremendous strides have been made in our knowledge of the artificial feeding of infants which has approached almost a revolution. It is safe to make the statement that the major portion of the advances in our knowledge in this difficult field has come through observations made on infants in infant asylums. The infant then in the private home owes the asylum baby an everlasting debt of gratitude.

In September, 1914, I was appointed physician-in-chief of St. Ann's, and I desire to account for the infants admitted since that time. The statistical form used by Hess is the best which has come to my attention. At a glance can be seen just what has become of the infants intrusted to the institution. Figures which do not state the length of time the infants remained in the institution are of little value. By getting a large number of infants in and getting them out in a short time a wonderful record could be shown.

TABLE I.

SUBSEQUENT HISTORY OF INFANTS REMAINING AT ASYLUM  
SEPTEMBER, 1914

	Length of Stay in Institution					Total
	Less than 3 months	3 to 6 months	6 to 12 months	1 to 2 years	2 to 3 years	
Returned to homes or adopted .....	3	8	9	20	7	47
Died .....	2	1	4	3	1	11
Remaining in asylum..				73	29	102
						<hr/> 160

TABLE II.

SUBSEQUENT HISTORY OF INFANTS BORN IN THE INSTITUTION OR  
ENTERING THE FIRST FEW DAYS OF LIFE, SEPTEMBER,  
1914, TO SEPTEMBER, 1916

	Length of Stay in Institution				Total
	Less than 3 months	3 to 6 months	6 to 12 months	1 to 2 years	
Returned to homes or adopted.	33	11	7	3	54
Died .....	15	8	7		30
Remaining in asylum .....	4	29	32	43	108
					<hr/> 192



TABLE III.

SUBSEQUENT HISTORY OF INFANTS ADMITTED FROM SEPTEMBER,  
1914, TO SEPTEMBER, 1916, WHO WERE AT THE TIME OF  
ADMISSION OLDER THAN TEN DAYS

	Length of Stay in Institution			Total
	Less than 3 months	Under 1 year	Under 2 years	
Returned to homes or adopted .....	7	8	6	21
Died .....	2	2		4
Remaining in asylum .....	8	12	3	23
				—
				48
Infants remaining in asylum September, 1914.....				160
Received during the year.....				118
				—
				278
Died .....				26
Mortality .....				9.3%
Remaining in asylum September, 1915.....				129
Received during the year.....				122
				—
				251
Died .....				19
Mortality .....				7.5%

In connection with this mortality of 7.5 per cent. for the past year, mention should be made of the fact that during July we went through a severe epidemic of summer diarrhea; 50 infants were stricken all in the course of a few days. It was a serious affair and the symptoms were stormy; it was during a period of excessive heat. Under dietetic measures all but 2 recovered at the expense, however, of a sharp loss in weight.

Certain points have impressed themselves on us and bear mentioning. The asylum infant during the first five months of life is slow to gain in weight. The same may be said, however, in regard to a large number of infants met with in private homes that must be fed artificially. Subsequently, however, with the addition of well-cooked cereal to the diet the weight curve

ascends sharply. Because starch is not found in breast milk pediatricians in general have considered it heresy to add it to a young infant's diet.

Clinical experience extending over a protracted period with a wealth of material shows that the nutrition of a young infant is very markedly improved by the addition to the diet of a cereal which has been cooked over night and then strained. At five months of age infants will take gruel from a spoon with great relish; as much as one-half cup can be given in a day. At two months of age there are given a taste from a spoon; in four or five weeks the infant looks forward to it and takes two to four teaspoonfuls. Starch injury of the Germans has not been met with as the infants receive liberal quantities of cow protein and cow fat.

In connection with this low institutional mortality mention should be made of the fact that St. Louis has the lowest infant mortality of any large city in the country; ten years ago the death rate per thousand was 134.5 and this year it is but 82.1, certainly a very creditable showing.

Years of experience has taught us that in an infant asylum, where large numbers of bottles must be prepared daily, simplicity in the milk formulas is the key to success. It is a surprise to many that our successful results are obtained with but a few milk modifications. Instead of wrestling with 10 to 15 formulas, as was formerly our custom, we simply vary the number of ounces the infants receive in twenty-four hours so that there is a sufficiency of calories. Mixture No. 1 for young infants contains 11 calories in each ounce; the young infant receives 4 ounces of this mixture for every pound of body weight as soon as it will take it. The baby weighing 6 pounds at birth is allowed to take 24 ounces in twenty-four hours or  $3\frac{1}{2}$  ounces every three hours, 7 feedings in twenty-four hours. The average infant at three or four days takes 1 ounce, at eight days 1 to 2 ounces, at fourteen days  $1\frac{1}{2}$  to 2 ounces, at three weeks 2 ounces, at six weeks 3 ounces, at eight weeks 4 ounces. On reaching a weight of  $8\frac{1}{2}$  to 9 pounds infants receive Formula No. 2, which contains 18 calories for every ounce. Infants to gain weight when fed artificially require 50 to 55 calories for every pound during their first six to eight months of life. Our babies are allowed 3 ounces of Formula No. 2 mixture for every pound of body weight.

## FORMULA NO. 1

$\frac{3}{4}$  quart skim milk  
 $\frac{1}{4}$  quart barley water (thick)  
1 ounce by measure Mellin's Food  
 $\frac{1}{2}$  ounce granulated sugar

## FORMULA NO. 2

$\frac{2}{3}$  quart whole milk  
 $\frac{1}{3}$  quart barley water (thick)  
1 ounce granulated sugar.

As a rule the milk is acidified with lactic acid bacilli twelve hours before being made up, having first agitated it.

## SUMMARY

To summarize, we would say that the appalling mortality of infant asylums is entirely unnecessary. The putting into practice in these institutions the numerous additions to our knowledge in the proper way of nourishing these infants, proves that the institution itself is not the root of the evil. Infants can be successfully taken care of in an asylum. But it is necessary that the old-time methods of feeding infants be discarded. Feeding problems and digestive disturbances do not, as of old, give us our greatest worries. When our knowledge advances sufficiently that we can cope with infections of the respiratory apparatus rare indeed will there be a death in our institution.

*1467 Union Avenue.*

## FREQUENCY OF TUBERCULIDES IN INFANCY AND CHILDHOOD AND THEIR RELATION TO PROGNOSIS\*

BY T. C. HEMPELMANN, M.D.

St. Louis, Mo.

The frequency with which tuberculides occur in the tuberculosis of childhood is not sufficiently recognized. There is probably a twofold reason for this: In the first place, tuberculides are small, insignificant looking, and easily overlooked; secondly, the dermatologist, who is best qualified to recognize these lesions, sees comparatively few infants in his practice and it is just at this age that tuberculides are most common. While almost any form of skin tuberculosis may be seen occasionally in infancy, all but two varieties, lichen scrofulosorum and the small papulonecrotic tuberculide, are rare at this age, and discussion will be limited to these two varieties. The typical papulonecrotic tuberculide as seen in infancy is a very slightly elevated tiny papule, at first of a reddish color and later taking on a brownish tint. As the lesion grows older it becomes flat-topped and takes on a glistening appearance, and a small crust or scale develops in its centre. This scale can be picked off, and leaves a little depression, occasionally with a bleeding point. Many lesions show the central depression without the scale, this latter having been cast off earlier. They may appear in any locality, but the sites of predilection are the extensor surfaces of the extremities, face and lower third of the trunk. The lesions may be present for weeks or even months, or may disappear entirely for a time and then new crops develop. Usually a small, delicate scar, with or without pigmentation, marks the site of the former lesion. Papulonecrotic tuberculides are generally few in number, from two or three to several dozen, but occasionally after some acute infection, particularly measles, the whole body may be peppered with lesions. Lichen scrofulosorum, on the other hand, consists of slightly elevated, follicular papules arranged in groups. They are of a pale yellow to yellowish-brown color and usually more or less covered with very fine scales. This type of lesion occurs most frequently on the trunk and the combination

\* From the Department of Pediatrics, Washington University and the St. Louis Children's Hospital.



of lichen scrofulosorum on the trunk with papulonecrotic tuberculides on the extremities is quite a frequent one.

There is considerable difference of opinion as to just how these lesions are produced. Successful animal inoculation experiments have been reported by several investigators, but others, failing to duplicate this, have felt that the lesions were probably produced by the circulation of tuberculotoxins, rather than by the localization of the tubercle bacillus. Recently, through the work of Jadassohn,<sup>1</sup> and Rist and Rolland,<sup>2</sup> an ingenious theory has been advanced to explain this discrepancy. Rist and Rolland regard tuberculides as virtually examples of the "phenomenon of Koch." They believe that tuberculides represent an autoinoculation of the skin with living, virile tubercle bacilli in a subject hypersensitized by previous infection with tuberculosis. In other words, they believe that in a subject allergic to the tubercle bacillus, tubercle bacilli are carried to the skin and there excite so prompt and violent a reaction that the bacilli are destroyed before having time to multiply. They feel that this explains the failure of the lesion to spread, and the failure to demonstrate tubercle bacilli in the lesions with any degree of regularity.

Here and there in the literature the statement has been made that tuberculides are of very grave prognostic import in the tuberculosis of childhood, and indeed it even has been asserted that their presence is an indication of a general miliary tuberculosis. It was with the view of perhaps throwing some light on these points that the present study was undertaken. The series consists of 40 cases of tuberculosis showing tuberculides, seen in the pediatric services of the Washington University dispensary and the St. Louis Children's Hospital.

*Frequency and Age Incidence*—In a series of 130 cases of pulmonary tuberculosis among infants under two years of age, tuberculides occurred 30 times (23 per cent.). Twenty-one of 62 babies in the first year of life (33.8 per cent.) showed tuberculides, and 9 of 68 in the second year (13.2 per cent.). The remaining 10 of the 40 cases of tuberculides were distributed among the older children as follows: 2 in the third year, 2 in the fourth, 1 in the fifth, 1 in the sixth, 2 in the seventh, 1 in the eleventh, and 1 in the twelfth year. (The percentage incidence

among the children over two years cannot be calculated because exact data as to the number of older children with tuberculosis are not available.)

*Lesions Associated with Tuberculides*—In all but 1 case there was evidence of lung or tracheobronchial lymph node involvement in addition to the tuberculides. In this one case the tuberculides were an accidental finding and the patient passed from observation before it could be definitely established whether or not he had some other tuberculous lesion. In 13 cases lung involvement was the only other lesion made out, while in 26 cases there were multiple organs involved. (It should be stated here that for the purpose of this study phlyctenular disease has been considered a manifestation of tuberculosis.) General miliary tuberculosis occurred six times in the series. Phlyctenular keratoconjunctivitis occurred fourteen times. Meningitis occurred five times. Bone involvement was seen four times. In 4 cases glands other than the tracheobronchial group were definitely tuberculous, although several more showed lesser degrees of adenopathy, not necessarily tuberculous. Tuberculous otitis media, tuberculous peritonitis and choiroidal tubercles, each occurred one time. In all cases the tuberculides were of the small papulonecrotic variety, and in 5 cases there was lichen scrofulosorum in addition.

*Fate of Children with Tuberculides*—(See table.) Of the 40 children, 13 are known to have died, 11 of these being in the first year of life and the other 2 in the second year. Eleven children were observed for a period of at least one year after the occurrence of tuberculides and were living and doing well when last heard from. Five of these were in the first year of life, five in the second, and one in the fourth. Of the 5 under one year old, 3 were observed for two years or longer, 2 for three years or longer, and 1 for five years. Of the 5 in the second year of life, 2 were observed for three years and 1 for four years. One other child, three and one-half years old when tuberculides were first discovered, was living at the time of the last note on the history, over two years later. In addition to these children, there were 16 more who were living when last heard from, but who were observed for periods of less than a year, and who are classified in a separate group, because of the uncertainty of their fate.

## FATE OF CHILDREN WITH TUBERCULIDES

Age	Died	Living more than one year after appearance of tuberculides	Living more than two years after appearance of tuberculides	Living more than three years after appearance of tuberculides	Living more than four years after appearance of tuberculides	Living more than five years after appearance of tuberculides	Fate unknown
0-1 year ...	11	5	3	2	1	1	5
1-2 years ...	2	5	2	2	1	0	2
2-3 years ...	0	0	0	0	0	0	2
3-4 years ...	0	1	1	0	0	0	0
4-5 years ...	0	0	0	0	0	0	2
5-6 years ...	0	0	0	0	0	0	2
6-12 years ...	0	0	0	0	0	0	3
Total....	13	11	6	4	2	1	16

## SUMMARY

A study was made of 40 cases of tuberculosis in children showing papulonecrotic tuberculides. Thirty of these were infants under two years of age and the other 10 were distributed through the period between two and twelve years. In a series of 130 cases of pulmonary tuberculosis in infants under two years of age, tuberculides occurred thirty times (23 per cent.). Sixty-two of these babies were in the first year of life and of these, 21 showed tuberculides (33.8 per cent.). Sixty-eight were between one and two years of age and 9 of these (13.2 per cent.) showed tuberculides.

In all but 1 of the 40 cases there was evidence of lung or tracheobronchial lymph node involvement in addition to the tuberculides.

Tuberculides seem to bear no direct relation to prognosis, as some children are now under observation who showed tuberculides three, four and five years ago.

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# PERIODIC VARIATION IN THE RATE OF GROWTH OF INFANTS\*

BASED UPON THE WEIGHTS OF 1,000 INFANTS

BY ADRIEN BLEYER, M.D.

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Robertson<sup>1</sup> in a recent paper finds that "while we now possess a fairly accurate and extensive knowledge of the normal curve of growth of certain animals, particularly the white rat and the white mouse, it is a regrettable fact that we are not yet in possession of equally reliable and extensive data concerning the growth of human beings." Minot<sup>2</sup> states that no statistics of an accurate character bearing on the external factors of growth in infants are known to him. Schloss<sup>3</sup> says that with the exception of food, none of these have been closely investigated. Data pertaining to these factors, gathered on a sufficiently large scale to guard against gross errors may therefore be of value.

The most important contribution on periodic acceleration and retardation of growth in children is doubtless that of Malling-Hansen<sup>4</sup> which, although preceded by the work of Fleischmann, Vierordt and particularly that of Camerer, was the first from which a more or less exact rule could be fixed. These studies were made upon 130 children between nine and fifteen years of age, were reported in 1883, and have since been confirmed by Vahl,<sup>5</sup> Buffon,<sup>6</sup> Camerer,<sup>7</sup> Godin<sup>8</sup> and probably by others. In Camerer's early work there were 2 young children, 1 of one year and 1 of three, for this reason and because these were the first observations to appear, a summary of the data collected by him may be given.

Average daily gains in grams at different seasons of the year recorded in Camerer's 5 cases:

No.		In Fall	In Winter	In Spring	In Summer
1.	10 years old . . . . .	24.3	2.5	14.	0
2.	8 years old . . . . .	14.5	7.6	—2.	—1.9
3.	5 years old . . . . .	17.1	3.2	6.7	4.7
4.	3 years old . . . . .	5.12	0	9.8	4.9
5.	1 year old . . . . .	6.8	2.05	4.15	2.7

\* From the Department of Pediatrics, Washington University Medical School.



Acceleration in the rate of growth in the fall months of the year may be seen in these figures although the activity of growth in spring which they appear to indicate and which Camerer believed to be true seems to have been in error.

Malling-Hansen's work, as was said, was much more extensive than the above and enabled him to divide the year into three periods which appear to be quite well defined, a period of minimal growth was found to occur between mid-April and mid-July, a period of maximal growth between mid-July and mid-December, and a period of mean growth, the so-called "rest period" from mid-December to mid-April. The differences between these were found to be very great, growth in the maximal period being twice or even three times as great as that in the minimal period. The maximum weight of a child in a given year of his life may therefore occur at the beginning of that year if this comes at the close of a period of maximal growth, an example of which is given by Friedenthal<sup>10</sup> of a child weighing 12,000 grams in December and 12,000 grams the following July, the long period of stationary weight passing without pathologic significance.

So far as I have been able to find, no extensive tabulations have been made to determine the existence of such variations in early life and it was to determine this point and also to ascertain if possible the influence of summer heat upon the rate of growth of infants that the present work was undertaken. In this study a simple tabulation was made of the weights of 1,000 babies who had attended the Conference for Well Babies at Washington University Dispensary. Records were selected of infants showing normal temperatures on the day of weighing and an absence of recorded illness both on the day of weighing and the next preceding visit to conference. Because of the need of dealing with well babies no records were used which showed a loss of weight. The gains were averaged on a basis of grams per day and were then transposed for greater convenience into grams per week, and in this way they appear upon the charts. Half of the infants were in the first year of life, half in the second, altogether there were tabulated 3,800 weighings which were fairly evenly distributed through the various months of the year and were drawn, not from any one year but during a period of five years.

Chart I. represents the summary of average weekly gains of infants in the first year and Chart II. of those in the second year. A definite coincidence with the findings of Malling-Hansen for

older children is evident in both and is more strikingly seen in Chart II. than in Chart I. In the first year the variations although sufficient to show the rule, were not very great, the extremes

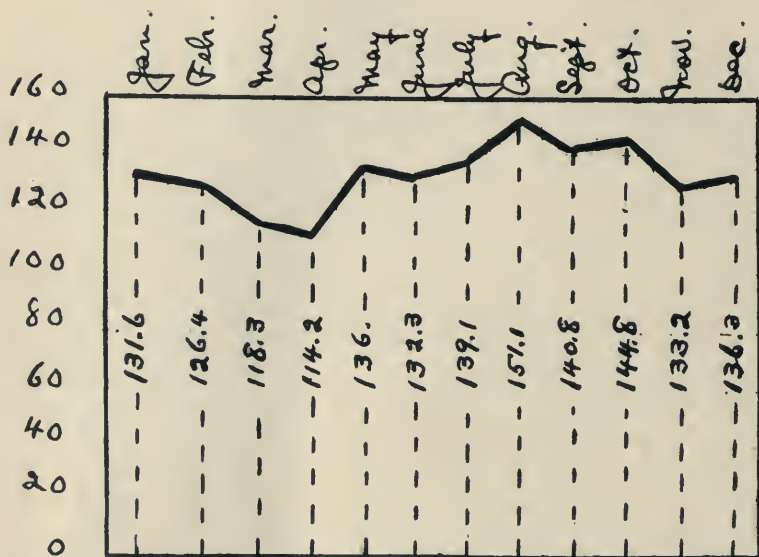


CHART I. Average weekly gains in grams first year

being seen between the rate of growth in August when it was greatest and in April when it was least, there is a difference in the average weekly gains between these of 30.9 grams. The average gains for the summer and fall months, May-October were 140.7 grams as compared to average gains of 126.6 grams per week during the winter and spring months, November-April.

In the second year the variations were much more marked, as may be seen by comparing June to October, where the difference is slightly over 100 per cent., the two-year-old infants averaging 55.5 grams per week in June and 123.8 grams per week in October. The period of maximal growth in the second year corresponds well with the figures of Malling-Hansen, namely, the rapid rise in July to an average of 85.4 grams per week, in August to 110.4 grams, remaining at this high plane in September and going to 123.8 grams in October, the highest weekly gains of any month of the year. Following the division into periods suggested by Malling-Hansen, it was found that the

average weekly gains from April to July were 77 grams; from August to November, 113 grams; from December to March, 86 grams. This is represented by schematic Weight-Chart III.

A tabulation of the manner of feeding was made and it was found that among breast-fed infants the variations in different seasons of the year were less marked than was the case in infants artificially fed. The sexes were considered together, although it is probable that had they been considered singly, greater variation would have been found among males as is indicated in the observations of Robertson,<sup>1</sup> Schmid-Monnard,<sup>11</sup> and others.

Various hypotheses have been advanced to explain the phenomenon of periodic variation in the rate of growth, but no scientific support of any of them was found. Camerer's idea that the acceleration is due to change of diet would not seem to apply to infants, because in the first year no change is ordinarily made, nor is the diet largely different in summer in the second.

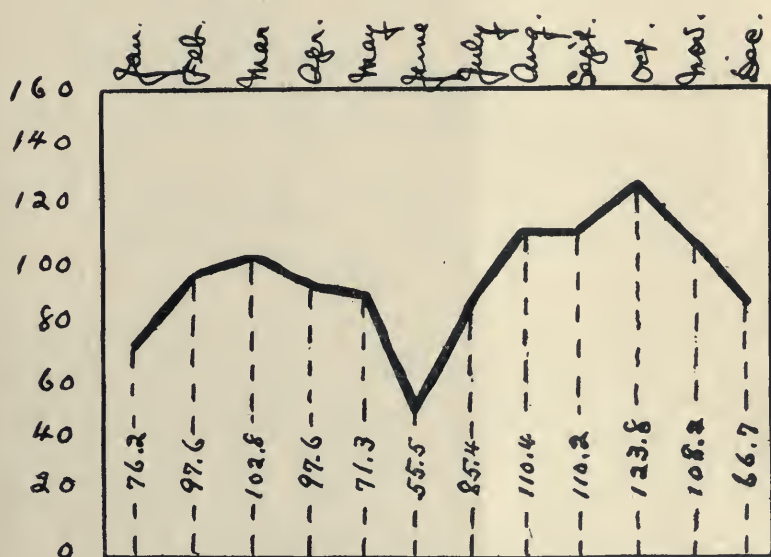


CHART II. Average weekly gains in grams second year

(It may be mentioned that St. Yves Ménard<sup>12</sup> and also Cornevin<sup>13</sup> observed acceleration in the rate of growth in cattle in summer and fall, and found that this occurred independently of a change in diet.)

It is not essential to enter into a discussion of other hypotheses which have been suggested, with the exception of one and to this one a certain and particular interest is attached, namely, the possible relation of summer heat to the rate of growth of infants. Perhaps the most interesting and one of the very few articles which have been written on this subject is that of L. F. Meyer<sup>14</sup> concerning observations made upon infants in a Berlin orphanage. He found that during the unusually hot month of July, 1911, the weights of the infants did not increase as they had during July of the preceding year when the weather was not so hot, and he found by comparing the weight gains of

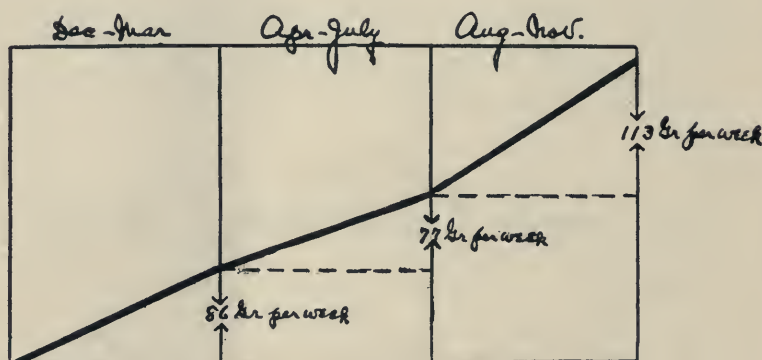


CHART III. Seasonal variation in the rate of growth in weight in the second year.

infants in summer to those of other times of the year that they were consistently lower in the warmer seasons. Meyer concluded from these data that summer heat has a retarding effect upon the rate of growth of infants. Nothing more will be said except to mention that it would seem that the water losses to which Meyer attaches particular importance probably need not occur among infants suitably protected and that undue water losses are probably pathologic rather than physiologic.

#### CONCLUSIONS

First, periodic variation in the rate of growth, consisting of an acceleration from mid-summer to late fall, a retardation in winter and greater retardation in spring and early summer, was found to exist among infants.



Second, this would not appear to be due to change of diet.

Third, weight gains in the first year of life were greater in summer and fall than in winter and spring and in the second year of life the best gains were made in August, from which it would not appear that heat has a retarding effect upon the rate of growth, but may even favor it.

Fourth, it would seem that the external factors of growth may have to be taken into account in constructing normal weight curves for the first and second years of life.

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PREVENTION OF INFANTILE PARALYSIS—Although we are still in great ignorance as to the mode of transmission of infantile paralysis, it is pretty well agreed that the most common avenue of infection is through the mucous membrane of the nose. Hence it seems to W. S. Whittemore (*Boston Medical and Surgical Journal*, 1916, Vol. CLXXV., p. 231) logical in combating the disease to use a substance which has been shown to be capable of practically sterilizing the nose and throat and is, moreover, free from any irritating effect. From experience with kaolin powder in the treatment of infections of the nose and throat during the past year, he suggests its use as a possible method of preventing infection of children and adults with infantile paralysis. It should be insufflated into the nose and throat every two hours during the day.—*American Journal of Obstetrics*.

# CASE REPORTS OF INFECTIOUS MENINGITIS DEVELOPING IN BABIES TWENTY-NINE AND THIRTY-NINE DAYS OLD RESPECTIVELY \*

BY T. WISTAR WHITE, M.D.

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CASE I. Baby Perrins. Born January 17, 1916, at term of an eclamptic mother. For some days he cried a great deal. Nursed poorly. When two weeks old he developed a purulent conjunctivitis, smears from which showed a diplococcus, pronounced gonococcus.

When three weeks old, the mother and baby left the hospital, the mother with normal urine and abundance of milk, the baby nursing well and apparently gaining in weight. A few days later the baby vomited and had a few thin stools. The physician in charge stopped the nursing and gave Mellin's Food for two days, then returned to breast on February 15th. On the afternoon of this day baby had a severe convulsion. When seen by doctor same evening, temperature was 98° F. He had vomited once when water was given. Seen by the author in consultation with Dr. Eisle on February 16th, when thirty days old. Fairly nourished baby in apparent coma, but crying at intervals and easily aroused. Temperature not taken, but apparently normal. Pulse and respiration irregular. Head slightly retracted, fontanelle bulging and sutures separated, but no contractions of extremities and eyes negative. Performed lumbar puncture but obtained no fluid on three attempts. From absence of fever the author made diagnosis of acute hydrocephalus with obstruction. Advised thyroid extract and puncture of ventricles.

February 17th. Temperature reported 98.5° F.

February 18th. Temperature 100° F.. Tapped right lateral ventricle after first puncturing the dura and determining the absence of fluid over the cortex, obtaining 1 ounce of a colorless, but slightly turbid fluid, in which the pathologist reported pus and a Gram negative diplococcus. Discontinued thyroid and prescribed urotropin.

February 19th. Again tapped right ventricle withdrawing 20 c.c., last few drops of which were bloody, and injected 15 c.c. of Flexner's Serum. Again attempted lumbar puncture obtain-

\* Reported for the St. Louis Pediatric Society.

ing only a few drops of clotted fibrin, containing pus cells and diplococci.

February 20th. Withdrew about 40 c.c. from left lateral ventricle, and injected 15 c.c. Flexner's Serum. Retraction is more marked and fontanelle is now distended. Had two convulsions during past twenty-four hours and temperature reached 102°F., though fair amount of food was well taken from medicine dropper and has not vomited. Bacteria positively identified as meningococcus.

February 21st. Patient seems worse. Six severe convulsions in past twenty-four hours. Highest temperature recorded 100°F. Took 21 ounces fluid from dropper without vomiting. Withdrew 40 c.c. fluid from right ventricle, and acting on the suggestion of Dr. Harris, who informed me that in 95 per cent. of his post-mortems the lesion is located at the base of the brain, although the ventricles may be distended, we injected half the tube of Flexner's Serum subdurally and the other half in the ventricle.

February 22d. Fontanelle less tense. No convulsion past twenty-four hours. Takes two ounces food through nipple every two hours, and has not vomited. Dr. Zimmerman removed 30 c.c. fluid from ventricle. Fluid seems less cloudy and contains less bacteria than yesterday.

February 23d. Three punctures reported made in unsuccessful attempt to tap the ventricles, but patient showed no ill effects.

February 24th. No convulsion past twenty-four hours. Patient nursed 14 ounces fluid from bottle during the day. No vomiting. Highest temperature recorded 100° F. Fontanelle seems more distended, sutures more widely separated. Slight nystagmus. Neck less rigid and no contractions of extremities, except when irritated; 4 c.c. fluid removed by lumbar puncture under low pressure. It was cloudy but contained no large fibrin clots as in the one previous successful puncture; 1½ ounces removed from ventricle. It seems less cloudy than last specimen. Patient had severe convulsion during the operation, apparently induced by pressure on the head to facilitate the flow. Injected 15 c.c. Flexner's Serum.

Saw baby again on March 22d, with Dr. Harney, who, with Dr. Zimmerman, supplied the history in the interval. The baby has overcome the infection, the fluid is clear and cultures negative, though, as was to be expected, he has developed a secondary hydrocephalus. The obstruction persists. Lumbar puncture

negative. The ventricles were punctured successfully sixteen or more times and 180 c.c. of Flexner's Serum injected. On one occasion 135 c.c. of fluid was withdrawn. Usually 15 c.c. of serum was given daily though several times this was doubled. Convulsions were frequent, the last a mild one, occurring on March 10th. For some time all attempts to reach right ventricle have been unsuccessful. In appearance the baby is well nourished, has gained two pounds in past three weeks. The hydrocephalus is not extreme. The circumference of the head is  $16\frac{7}{8}$  inches,  $\frac{5}{8}$  inch larger than at the beginning of the disease. He has a staring appearance and slight mystagmus. From incomplete examination an oculist believes his sight unimpaired. Hearing is apparently lost. There is no muscular paralysis or contractures, except the thumbs, which are strongly adducted.

The punctures are being continued at intervals with the hope that the inflammatory material causing the obstruction, will be absorbed and Nature given a chance to take care of the excess.

Thyroid extract and iodine are being given.

Ventricular puncture, though persisted in, to within a few weeks of his death, was unavailing. He died of extreme hydrocephalus December 15th, when eleven months old.

CASE II. Juniata Leonard. Negro. Born November 25, 1915. December 25th, admitted to the City Hospital with diagnosis of coryza and laryngitis. Temperature  $100^{\circ}$ . Physical examination of chest negative.

January 3d, when thirty-nine days old, had a convulsion. No coma. Eyes negative. Fontanelle distended. Reflexes exaggerated. Nursed bottle.

During the following two weeks the cerebral symptoms became more marked, but the baby continued to nurse bottle. Vomiting was no more frequent than in normal baby. She evinced no pain, except when irritated. Facial expression calm with eyes open, but opisthotonos gradually becoming extreme with contractions of arms and legs. Various efforts at diagnosis were made. Spinal fluid by lumbar puncture negative. von Pirquet and Wassermann negative. Temperature rarely reached  $100^{\circ}\text{F}$ .

From January 19th to 31st, lumbar puncture performed five times but only 2 to 4 c.c. under low pressure obtained, bacteriological report always negative. Fluid obtained on latter date gave cell count of 480 mostly lymphocytes



February 2d. In view of low pressure of fluid on lumbar puncture and high tension of fontanelle, we punctured left lateral ventricle through the fontanelle, obtaining 1 ounce of a very slightly cloudy fluid. Same day received laboratory report of culture of a Gram negative diplococcus from the fluid of last lumbar puncture and a verbal statement that the cultural characteristics excluded meningococcus and gonococcus. The same report was made on fluid obtained from the ventricle.

The baby died February 5th, thirty-three days after the initial convulsion. The degree of opisthotonos in this case was extreme. I was greatly disappointed in not obtaining a picture at this stage. The head was retracted until it faced backward, if not backward and downward. Even during this latter period, when we were able to hang it on the foot of the bed by the back of its head, it apparently suffered very little pain. It was not in stupor, but awake with eyes open, and suckled the bottle up to within a few hours of its death, and as stated above, vomiting was never a feature.

Necropsy was performed by Dr. Scherry, who found the ventricle greatly distended and lined with a membranous exudate. With press of work, cultures of the organism were allowed to die before identification was complete, but he is inclined to think it was a form of meningococcus. If the first statement that it was neither meningococcus nor gonococcus could be relied upon, the most probable organism would be micrococcus catarrhalis. This possibility would be borne out by the preceding coryza, the mild course and low temperature of this case. While a great variety of bacteria, including gonococcus, have been reported in the cerebrospinal fluid, I am not aware that the micrococcus catarrhalis has been so found. However, this point will remain in doubt in this particular case.

These two cases have two interesting points in common, the onset of an infectious meningitis at such an early age (twenty-nine and thirty-nine days), and an inflammatory obstruction at the "iter." Baby Perrin's recovery from this infection is remarkable, in view of the high mortality from epidemic meningitis in infancy. This outcome would seem to suggest this mode of treatment in all cases with patulous fontanelle. Why not inject the serum directly into the ventricles, even in cases without obstruction, and withdraw the fluid by lumbar puncture? There is apparently little *immediate* danger in puncturing the ventricles,

even in those not enlarged as these two undoubtedly were. In only one of a number in which I have done this have I witnessed any ill effects. This baby, which later proved to be luetic, suffered quite a shock immediately following an unsuccessful puncture, but recovered in a short time with no symptoms referable to the operation, and this shock was no more severe than that often observed after lumbar puncture and injection of serum.

*Lister Building.* \_\_\_\_\_

TREATMENT OF RICKETS—E. Pritchard (Proceedings Royal Society of Medicine, 1916, Vol. IX., Section Study of Diseases in Children, p. 91) says that for the disposal of an excess of food the most economical expedient is to store up the excess in the form of a food reserve—for instance, as glycogen or fat. A second method is that of combustion or oxidation to the normal end products, carbonic acid gas, urea and water. A third alternative depends on the short-circuiting of the oxidation processes, in fact, on the production of incompletely burnt-up products of combustion. This method has the advantage of saving oxygen and of limiting heat production, but the disadvantage of flooding the blood with acid bodies of large molecular size, such as lactic, oxalic, uric, glycuronic, diacetic, *B*-oxybutyric, and certain other organic acids. If infants are kept in hot, stuffy rooms, if they are wrapped up in multiplicity of clothes, if they are seldom taken out of doors, and if they are given no opportunities for muscular exercise, they will create no demand for food, and consequently any dietary, however small, may be *relatively excessive*, and if excessive must be disposed of by one of the protective methods described. These are the usual conditions which surround the victims of rickets. Under such conditions we could predict that the child would, if he could, lay up stores of glycogen and fat and become obese; that he would show evidence first of excessive combustion by sweating and vascular dilatation of the superficial capillaries of the face and other exposed parts and possibly by disturbances of the heat-regulating centers, and then of suboxidation with the symptoms of an acidosis, with enlarged epiphyses and demineralization of bone; and finally of acyanotic hyperpnea with other serious nervous manifestations. The writer has for many years treated all cases of rickets on the assumption that this is the true pathogenesis of the disease.—*The American Journal of Obstetrics.*

## ST. LOUIS AS A PEDIATRIC CENTER

BY GEORGE M. TUTTLE, M.D.

St. Louis, Mo.

St. Louis is the fourth city in population in the United States, having about three-quarters of a million inhabitants at the present time. Across the Mississippi River are East St. Louis and its suburbs, the second most populous center in the State of Illinois. Probably one million people dwell in the immediate environs of St. Louis.

This greater St. Louis is the undisputed metropolis of the Mississippi Valley and the Southwest. Her commerce and trade extend into the whole tributary region, and she is naturally looked to as the center of educational influences for the same district. From this populous region she draws her students, and in return supplies finished and trained professional men.

There are two large universities located in St. Louis, each with a well-organized medical department—Washington University and St. Louis University. In the year 1910 the authorities of Washington University carried out a well-conceived plan to develop the medical department of the University into an ideal medical school, founded on a strictly university basis, and to make it second to none in the United States. They felt that there was no such medical school west of the Atlantic seaboard, and that such a school in the Middle West would fill a real demand, and would bring a prestige to the University that the development of no other department could equal, and that, further, it would put St. Louis on the Medical map. The fact that ARCHIVES OF PEDIATRICS is devoting a "City" number to St. Louis acclaims this suggestion as a wise one. Within the year, through the generous coöperation of the General Educational Board, and the authorities and friends of the University, the Chair of Pediatrics has been endowed, and the department will very shortly be on a strict University basis.

The importance given to pediatric teaching is enhanced by a close affiliation made between the University Medical School and the St. Louis Children's Hospital, a well-established institution with an active, busy service both in its wards and in its out-service department. This hospital built a modern up-to-date new building on the same ground with the medical school four years ago, these two factors making it an integral part of the medical school.

The Children's Hospital has 160 beds devoted to the medical and surgical care of infants and young children, both free and pay patients being admitted. There is also a large unit devoted to the care of contagious diseases. All facilities for bedside instruction and study in diseases of infancy and childhood are offered here.

The hospital is well supplied with clinical and research laboratories of its own, but also has free access to all the exceptional facilities of a similar nature offered by the medical school, the buildings all being adjacent to one another, such as the departments for X-Ray work, for electrocardiographic work, for research in physiology, chemistry, metabolism and bacteriology, as well as investigations from animal experimentation. The departments of anatomy and pathology are also definitely in use by the hospital.

The staff of this hospital is exclusively composed of the head of the pediatric department and his assistants, and both third- and fourth-year students must take regular instruction and work in the wards and laboratories of the hospital.

The Children's Hospital has a very valuable Country Department, with a modern fireproof building, erected for this purpose, on a bluff overlooking the Meramec River, about twenty miles from the city. It is ideally located for the care of tubercular cases, convalescents, or cases of malnutrition from any cause. There are about 160 acres of land, part of it well timbered, and the rest cleared for farming, belonging to the hospital, on which chickens, cows, sheep and hogs are raised, to provide eggs, milk and other food for the inmates.

The staff has conducted some interesting work here in heliotherapy on children with tubercular bone diseases. The results have been both interesting and encouraging. There are accommodations for 50 children in this country branch, and as far as practicable, owing to its distance from the city, this department is also used for teaching purposes.

St. Louis, owing largely to its old Southern prejudices, has entirely neglected its duty in offering hospital facilities to negro children, with the result that there is an unfortunate loss of an abundance of splendid clinical material which could be utilized for pediatric teaching to wonderful advantage. So far they are only cared for, and used for teaching as out-patients.

The out-patient department of the St. Louis Children's Hospital is amalgamated with the Washington University Dis-



pensary. Here all the clinics are grouped together on two floors of a building recently constructed for that purpose. The clinical and pathological laboratories of the medical school are on the upper stories of the same building. The staff of the pediatric department is in entire charge of these out-patients, and the hours are so arranged that full advantage of help from other specialists, eye, ear, nose and throat, skin, or nervous diseases, can be easily obtained, as well as such laboratory examinations as may be needed. In a recent year there were treated in the pediatric department about 11,000 patients.

The third-year students work in this clinic in small sections under the supervision of the out-patient staff, and all its clinical facilities are available for teaching and research purposes.

The Bethesda Hospital is a large foundling asylum supported by the charity of St. Louis. There is in this institution a wealth of pediatric material, all of which can be easily used for clinical and research purposes. It is to a limited degree affiliated with the Washington University Medical School.

The same can be said of such pediatric material as is contained in the City Hospital, and the new Municipal Hospital for Infectious Diseases. The former has about 25 pediatric beds, and the latter has room for more than 300 patients, but many of the contagious cases are in adults. Of the latter institution St. Louis is justly proud, as it is a modern up-to-date building in which not only are the city's poor cared for on advanced lines by capable men from the two medical schools of the city, but comfortable arrangements are prepared for private patients who can be attended in rooms by their own physicians.

Here 8 different infectious diseases can be safely separated at the same time, and 10 can be in an emergency. All the infectious diseases except smallpox are cared for here. There is a large sun porch, and a large solarium, completely enclosed in glass except the floor and ceiling, adjoining each unit. In fact, the whole building leaves little to be desired.

Special courses in pediatrics for post-graduates are given each summer, after the closing of the college year, by members of the staff of the pediatric department. This is both laboratory and clinical in nature.

The medical department of St. Louis University, the other Class A Medical School in St. Louis, has also a well-organized pediatric department, giving out-patient instruction in the clinics connected with the college, and bedside teaching in feeding, and

clinical and pathological work in St. Ann's Asylum, a very large foundling home controlled by the University. All the clinical work is interwoven with the laboratories of the Medical School. This school also shares with the previous one in caring for the children in the City Hospital, and in the Municipal Infectious Hospital, in both institutions using the material freely for teaching purposes. The school also offers summer courses in pediatrics for undergraduates and graduates who may desire special laboratory or clinical work in this subject.

Apart from distinctive pediatric teaching, a vast amount of important work is being done in St. Louis intimately connected with infancy and childhood, and vitally modifying their sanitary conditions.

The St. Louis Milk Commission, for instance, has been in existence and operation thirteen years. During this time it has regularly supervised and encouraged the production of certified milk, until at the present time this milk is being produced by 9 dairymen, and about 580 gallons a day are sold in St. Louis. It also maintains a laboratory for milk modification and distribution through subsidiary stations, scattered through the poorer districts of the city, to feed the babies of the poor. In these years some six and a half million bottles of milk have been distributed, about 15 per cent. of it free and the rest at a nominal charge.

The educational influences emanating from this thirteen years' work, in teaching the value of good feeding habits, is, if anything, greater than the good done in prevention of sickness and death among the babies fed by the Commission.

In connection with this work there are 14 feeding clinics, located at certain of the distributing stations, at which physicians and trained nurses are in attendance to advise mothers as to the progress of their babies, and to change the milk modifications as conditions demand. The nurses also have the usual duties of following up the cases, and giving instruction in the care and preparation of milk at home. These nurses are supported partly by the Milk Commission, but largely by the Visiting Nurses Association, and more recently the Municipal Nurses Bureau has been supplying some of the nurses out of appropriations from the city.

Scarcely separated from these activities is the general subject of Baby Welfare work in St. Louis. The slums of the city are divided into 9 districts, in each of which a nurse is at work, either from the Visiting Nurses Association or from the Muni-

pal Nurses Bureau. This nurse seeks out newborn babies either as they are referred by the various obstetrical clinics of the city, or by calling on all neonati as they are reported to the Health Department, or in whatever way they can be discovered. Instruction in the importance of breast feeding, and aid to the mother in the way of food or money, through any charitable organization, to encourage this are first stressed. If artificial feeding becomes necessary, instruction or reference to proper clinics is impressed, and thus much gastroenteric trouble is prevented.

In each district a clinic once or twice a week, distinct from the feeding clinics of the Milk Commission, is also held, at which a physician advises the mothers in the care of both well and sick babies. Often these clinics are combined with a milk station.

The Social Service Department of Washington University also maintains a prenatal clinic in connection with its obstetric department. While the care here is primarily of the expectant mother, these cases naturally feed the Baby Welfare Clinics, and both work together for the same ends—the saving of many a needless infant death.

In the last ten years the infant mortality rate in St. Louis per 1,000 births has fallen from 132 to 82, evidencing the fact that these various educational influences are bearing fruit of a substantial nature.

St. Louis has a Juvenile Court System doing very efficient work in the management of delinquent children. It is aided by a number of public-spirited physicians who give their services freely to help the Court in making just decisions in cases where special medical advice is of value. This Court is of decided aid to pediatric work in forcing stupidly ignorant parents or guardians to submit their children to needed medical or surgical treatment.

A few Day Nurseries and an Underage Kindergarten Association help working women by keeping their little children in sanitary and moral surroundings while the mothers are busy elsewhere.

St. Louis has one unique institution of interest to pediatricists which, still in its infancy, is already beginning to attract considerable attention—the “Central Institute for the Deaf.” Its Charter says the Association is formed for the following purposes: “To promote educational measures in the interests of the deaf; to instruct the deaf and the hard-of-hearing child by progressive oral methods; to provide free scholarships for needy

deaf children and for normal students; to maintain training classes for teachers; to instruct deaf adults in lip reading; to correct defects in speech; to establish free educational clinics for the deaf; to maintain an otologic bureau of information; and to receive and hold gifts and bequests to be used in connection with the aforesaid purposes." The special strength and feature of the work consists in the close and serious coöperation of the trained and progressive teacher of the deaf and the experienced otologist.

This institution has already proved its value in instructing the deaf child in purely oral methods of speech and lip reading, and in developing research for further improvements along this line. It has conclusively proved that the field of usefulness and activity of the orally-educated deaf has been greatly extended.

The Institute is housed in a new building erected for its own use, and is a combined day and boarding school for these afflicted children.

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THERAPEUTICS OF ACUTE LOBAR PNEUMONIA IN CHILDREN—Adolf Baginsky (Arch. f. Kinderheil., Bd. LXIV. Heft III.-IV., 1915) gives histories of a number of cases of pneumonia in children, which were treated very simply, but which nevertheless all recovered, to show that if we give the "*vis medicatrix naturæ*" a fair chance by assisting it with proper feeding and hygiene we shall cure most of our cases without any elaborate system of therapeutics. These cases were treated by milk diet, hygiene, and ice applied to the thorax, without any drugs taken internally. He made use of no antipyretics, no heart stimulants, no expectorants. He regards painting the chest with iodine, hot baths and sweat packings, and light baths as useless. Without their use resolution will take place just as well as in the mildest cases. He does not think that he can give any precise rules as to the therapeutic care of every case of pneumonia, since the course and complications of each must cause some variation in the treatment. But he believes that it will be of great advantage if all medical students leave the hospitals with the conviction that in children at least we may treat pneumonia simply and without the use of a long array of antipyretics, heart stimulants and expectorants.—*The American Journal of Obstetrics.*



## SOCIETY REPORT.

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### THE NEW YORK ACADEMY OF MEDICINE—SECTION ON PEDIATRICS

*Stated Meeting, Held March 8, 1917*

THE PRESIDENT, ROGER H. DENNETT, M.D., IN THE CHAIR

#### THE EMOTIONAL LIFE OF THE CHILD

DR. CLARENCE PAUL OBERNDORF read this paper (to appear in a later issue of ARCHIVES).

DR. HERBERT B. WILCOX said that Dr. Oberndorf's remarks as applied to child life had rather inseparably coupled interpretation of such emotion with pleasure, in particular to pleasure of a sexual nature. Whatever the psychoanalytical interpretation of the term "sexual" might be, it must ultimately refer to elements which were, to his mind, as yet usually dormant in the patients of the age they were considering that evening.

Pure psychology had little place in the activities of the pediatrician, excepting as it was applied by him to the parents with whom he dealt. Physiological psychology, however, as applied by him to the neuroses and habit spasms of children played a very important part in his work.

Dr. Wilcox said he wished to take up the question of emotion in children, particularly and only as to its influence upon their habits and routine life.

To his mind thumb-sucking had really no relation to the question of food, or of sexual pleasure, or of emotion, although the child at first might suck his thumb because he unconsciously expected to get nourishment from the process. Before long, however, he learned the fallacy of this belief, and then the process of thumb-sucking became purely a habit unassociated with the ingestion of food, and to his mind quite apart from any idea of erotic sensation. Later on this habit might become influenced by the development of some emotional association in connection with it. He had not seen, however, the substitution of any of the less desirable habits for that of thumb-sucking, when the latter had been made mechanically impossible. The point had

been raised with him at times by neurologists, whose children he had treated, as to the advisability of interfering with the habit of thumb-sucking on account of the possibility of the substitution of some more serious habit in its place. It was of course quite possible that this occurred at times, but it had not been a factor in his experience.

It was fortunate that Dr. Oberndorf had given them the lead he had, as the psychology of the child, and that of the parents' relation *toward* the child, should always concern the pediatrician.

It was often, for instance, far easier to prescribe a proper and adequate diet for a child than it was to overcome that child's objection to taking it. In the same way one could much more readily advise as to the sleep and exercise necessary for a given age than furnish a method of making the infant go to sleep when put to bed.

Dr. Oberndorf had spoken particularly of the emotional life of the child. Dealing as we were with younger children than he came in contact with, the emotional life was of interest to us principally in its application to the formation or interference with the formation of regular habits. In other words, from our standpoint it was a question of the *abnormal emotion* influencing the *normal* habit. This applied directly to the suppression or prolongation of the act of defecation which was referred to by Dr. Oberndorf as being an emotional element entering into and disturbing what should be an habitual response to a distended intestine, plus the increased peristalsis arising from the ingestion of food.

It was clear that the matter of expulsion of the intestinal contents should be, and was under proper guidance, purely a matter of habit, occurring at a regular time, and such a time as was most favorable to success; this time being shortly after a meal, when it was well known that peristaltic action was stimulated by the full stomach.

The infant, and the child up to the age of eight years, was, or should be, largely a creature of habit; habit established from within, physiologically; from without, governmentally. Habit and a more or less unquestioned submission to routine were the normal factors determining a child's reaction to his environment. When emotion entered too largely into his life then he tended to become distinctly abnormal.

Dr. Wilcox applied this question to one phase of the child's life, that was in the matter of the ingestion of food. Emotion *versus* habit was perhaps most often illustrated in the eating habits of the child from eighteen months on. As a habit, appetite should normally be the result of an impulse to fill a vacuum with *substance*, not a food selected for the purpose of giving gustatory pleasure, or of incurring the approbation of the urging, adjacent parent or nurse. When emotion came to enter into the question of eating, it usually was the expression of a desire to attract attention, and to occupy the center of the stage through some impulse in relation to food other than that of satisfying the appetite.

The habit of becoming hungry at meal times only and then eating to avoid the discomfort of subsequent hunger, rather than to produce pleasurable sensations, represented a good digestion, and had nothing to do with emotion. The meal eaten as a result of coaxing, urging or bribery was a poor substitute for a normal attempt to neutralize gastric secretions.

We had all been asked the question, "Doctor, how can I make my child eat? He does not take enough food to keep a bird alive." The answer is simple. "Don't try to make him eat. What he does not eat cannot hurt him. Let him alone until such time as he becomes hungry, and then make his food allowance small enough to keep him hungry and eating periodically to satisfy hunger."

This involved the general principle that a child should form his habits of life, not by following suggestions, advice or orders, but by himself discovering that deviations from a certain routine, resulted in discomfort. If he, unaided, once gained this idea, it would stick. If he simply accommodated himself to necessity he would cease to follow his routine the minute necessity ceased to be imperative.

There was no group of cases that offered more interesting problems of diagnosis, or presented more spectacular results, than those children who came to us because of poor appetite, and suffering from constant irritation through urging, coaxing and arguing at meal time, and who naturally presented as secondary symptoms bad assimilation, anemia and digestive derangements. These conditions could not be corrected by digestive aids or purely medical treatment. The basis of their trouble lay in the fact that they took their food under conditions

of nervous unrest due to interference and in the fact that they usually specialized on some type of food which threw off the balance of their food elements.

Emotion had now entered meal time in this way: The child refused to eat from obstinacy, a very natural result of too much urging and coaxing, or, later, because he emotionally enjoyed the attention he attracted. This represented the antipathy association spoken of by Dr. Oberndorf. So long as attention was paid to him, so long he would strive to attract it and refuse his food. When the abnormal stimulus was removed and no one any longer seemed to know or to care how much or how little he ate, he would find it dull playing the clown without an audience and return to his habitual responses to a physiological need.

DR. WILLIAM B. NOYES said that only two nights ago they had listened to a very remarkable paper by Dr. Glueck who was making a study of the criminals at Sing Sing prison and there was barely any reference made, either in the paper or the discussion which followed, to the development of the emotional life of the child. The many characteristics of the criminals were reviewed and they showed many traits of normal and abnormal children. There were three methods of psychological study that they should recognize at the present time. (1) The old-time method of distinguishing mental faculties as though they were in separate boxes, as attention, memory, judgment, emotions, volition, imagination, etc., a method which was less followed at the present time because it was realized that all the different mental faculties were so closely associated that they could not be thus separated. (2) The Simon-Binet method by which abnormal children might be distinguished from the normal ones, by comparing the defective child with the normal standard for a given age thus telling what age the mind had reached. This method gave very brilliant results in young children but after the child had reached the age of 11 or 12 years, it was not satisfactory. (3) The genetic method or the study of the mind from the standpoint of development. All phases of delinquency, psychological and neuropsychological were reviewed, but what was lacking and what one would instinctively have grasped was a study of the characteristics in criminals and delinquents which every child, normal or abnormal, showed. In the criminal there were lapses or temporary returns to the mental characteristics of childhood. In the kleptomaniac or pyromaniac they could



trace the mental defect to a remnant of early conflict. Many of the mental conflicts that occurred after puberty might be traced to a submerged sex conflict by the psychoanalyst, but there were many phases of delinquency which did not need the psychoanalyst to interpret; they were exaggerations of emotional characteristics of the infant and the child with which every pediatricist was familiar. It was difficult to draw the line and to say just where certain characteristics ceased to be desirable and became abnormal. Take for instance the "Gang spirit"; what could be more admirable than for a boy to be loyal to his friends and to stick to them as the gang did? Yet just how different was this from what the boy in the gang did. A different environment placed him in a bad set of boys. He either followed a leader or was the leader; if he was amenable to suggestion he followed a leader and they had the basis of much that was known as delinquency and yet was there anything abnormal in it? In the same way one might run through a whole series of traits in the boy, the girl, or the adolescent, and find difficulty in saying just when these traits became abnormal. They were often hazy when it came to diagnosis and they liked to follow sharp cut labels. Thus frequently in discussing delinquency they used the term "instability." The French used the word "debile." A still broader psychological term was "psychological constitutional inferiority." While these terms might be indefinite they all harked back to the first three or four years of life. The unstable child might not be defective in structure of brain and essential mental faculties, but the unstable child would ultimately be shipwrecked if not controlled and the time to control it was about two generations back.

DR. HORACE W. FRINK said he had been very much interested in Dr. Wilcox's remarks as to the necessity of establishing in the child proper habits of eating. From observations made from another angle, namely, the study of disturbances of appetite in neurotic adults, he could confirm Dr. Wilcox's statement that every care should be taken to avoid getting the child in the habit of refusing food as a means of getting extra attention and sympathy.

In reference to Dr. Oberndorf's paper he felt that perhaps some might have been baffled as to why such phenomena in the child as thumb-sucking and the holding back of feces should be called sexual. He wished to emphasize the fact that this term

had been given to them as a result of studies made upon adults who suffered from some disturbance of the evolution of the sex instinct, psychoneuroses, or perversions. In retracing through the life history of the individual the development of, say, an oral perversion, one found clearly apparent that the condition had developed by almost insensible gradations out of something apparently innocent and which was to be found in even the normal child, namely, the pleasure sucking to which Dr. Oberndorf referred. In other words, these infantile phenomena were named not so much on account of what they displayed to direct observation, but rather on account of what in pathological cases they might develop into. The term sexual as applied to them had of course a very different implication than is usually given to it in ordinary speech.

Dr. Frink also called attention to the fact that we need not be surprised by the statement that an organ, such as the mouth or anus, could serve two functions, an alimentary and a sexual one. The same was familiarly true of other organs of the body, the eye, for instance, which, though it has been given a great many non-sexual functions, was nevertheless one of the most important sensory organs for the reception of sexual stimuli.

DR. FRANK WADE ROBERTSON said he might be old-fashioned as he did not adhere so strongly to psychoanalysis. He thought that in many instances we laid too much stress on apparently insignificant things. We could not find out about the emotions of a child by judging them by the emotional standards of the adult. As far as the thumb-sucking and feces were concerned, the thumb-sucking was usually merely an incident in the child's life, and the questions brought up, in connection with the feces he would explain by the fact that the child regarded defecation as a disagreeable duty and put it off as long as possible so as to continue his play, but he could not see the modern idea of sexuality in it.

Dr. Robertson said he had another old-fashioned idea; he thought that probably sometimes a properly administered spanking would solve the problem and correct the bad habit. The parents were largely responsible as far as the emotions were concerned for the emotional exacerbations. If one considered the emotional life of the present day he would not be surprised that the child exhibited abnormal emotional traits. The mother was dashing away to the milliner, the dressmaker or a bridge party,

and she might get home for dinner if the game were over in time; the father was occupied with business affairs and there was no cohesion or order in the family life. The children seldom saw the parents and were brought up by nurses and attendants. We should teach that there is no holier duty for a mother than to properly bring up her child and to impress her ideal on the child. We should remember that early impressions endure as long as life lasts and that it is most important that correct ideals be cultivated from the first.

DR. SAMUEL W. BANDLER stated he had every intention of saying a few words but the previous speaker in his last sentence had said everything he had in mind. The paper was very full of truths, some of which we have read and which are known, and some that are new. This room should be full of physicians whose purpose it is to educate the public. Some are parents as well as physicians and it is to the parents who are not physicians as well as to the physicians who are parents that a knowledge of the emotional life of the child is important, but he would like to ask, in considering the emotional life of the child, if we were not failing to recognize the importance of heredity.

DR. OBERNDORF said Dr. Wilcox had brought up a question which was very difficult to solve in people who in later life showed neuroses, and that was the attitude of the parents. The parents of the neurotic adolescent continued to be of the same mental caliber as when the child was born and furnished the most difficult factor in the treatment of the young adult.

He had very recently had a case illustrating this point. The patient was a youth of nineteen who had a compulsion neurosis. The mother made him discontinue treatment because she said he (Dr. Oberndorf) had told the boy to come out to see him on a cold day, and also she said she thought the boy was well. In reality she did not want to be separated from the boy. She had such an attachment for him that if he were restless at night she could not resist the temptation to remain with him for the remainder of the night. In the case of the teacher with the pertinacious "mother attachment" which was mentioned in the paper, though she was thirty years of age, the mother came to her room every morning to spend a half hour in fondling her.

The pediatrician has the opportunity to anticipate the psychiatrist and to instruct the parents of the dangers of excessive care early in the life of the child.

Thumb-sucking is autoerotic, as was stated in the paper. Dr. Oberndorf said he would like to cite an interesting instance in which a tic had developed which reverted directly to the habit of thumb-sucking. This boy, aged ten years, suffered from a compulsive movement of raising his arm with the thumb projected into a position for sucking and then taking it away. He was taken from the mother's breast and was admitted to Willard Parker Hospital when one year of age. There he ran the gamut of children's diseases, remaining during the greater part of the second year of his life. While in the hospital he developed the habit of cumulative thumb-sucking and clung to the habit until he was six years old. Later children in the street recognizing such a habit as infantile taunted him by calling him "Abie the sucker." He tried to break the habit with the result that he developed the tic of making a movement as though he were going to put his thumb in his mouth and then inhibiting the act. His father had assisted him in the effort to break the habit by giving him ten cents a week. This the boy invested in hard candies on which to suck everlastingly, a rather poor substitute. In thumb-sucking psychologically the pleasure was based on autoerotism. Later masturbation was a similar autoerotic manifestation. Dr. Oberndorf believed this to be a normal transitional stage through which most children passed before reaching adult heterosexuality.

Autoerotism varied with the individual. Harping on heredity did not help one to correct the present. As far as heredity was concerned, we must let that matter stand and look to the future.

What Dr. Robertson had said with regard to holding back the feces as being an attempt to delay a disagreeable act, he did not agree with, he rather thought evacuation must be considered a pleasurable act. It would be a very unusual thing for a child to try to prolong any disagreeable act. For children as well as adults usually avoided disagreeable acts; the child probably got a certain amount of satisfaction through holding back from the stimuli from the anal zone.

Concerning Dr. Noyes reference to the work of Glueck at Sing Sing. This would prove valuable principally as a laboratory investigation rather than valuable in the sense of being beneficial to the individual investigated. If a man of Dr. Glueck's ability could be employed to help supposedly normal people solve some of their maladjustments it would perhaps be of greater benefit to the community. The study of the criminal adult might yield



some light on the best methods for meeting such tendencies in the very young.

Dr. Oberndorf also said one of his favorite hobbies centered in the belief that the time would come when every high school child, or even common school graduate, would be given a thorough overhauling psychologically just as he was now given a physical examination. This would be for the purpose of determining his fitness for a particular line of work, straightening out of mental kinks, and of directing his future activities in life.

DR. HERRMAN said various authors had considered as important factors in the causation of Mongolian imbecility, worry, emotional shock, and disease of the mother during pregnancy. However, many mothers of children showing this condition give no such history, and a very large number who have had trouble during pregnancy give birth to perfectly normal children. Nature in her desire to preserve and protect the species, protected the germ cell most carefully from all injurious influences. I wish to present the pedigree of a family which has come under my observation. The mother of the patients J. G. and A. G. was married twice. By her first husband she had one perfectly normal child; by her second husband, the first child was a Mongolian imbecile, the second a perfectly normal child, and the third a Mongolian imbecile. The parents were both healthy and the mother was perfectly well during all four pregnancies; she had no worry or shock. Shuttleworth mentions the case of twins, in which the male was normal, the female a Mongolian imbecile. In these instances it was hardly conceivable that a constitutional disease in the mother could be responsible either for the alternately normal child and the Mongolian imbecile or how it could affect only one of twins and not the other. Immaturity or exhaustion of the generative organs especially of the mother has been given as a cause of Mongolian imbecility. A certain percentage of the mothers of Mongols are very young or very old. In about one-third the mother is over forty years of age. There are, however, about two-thirds in which the mothers are between twenty and forty years of age. Large numbers of perfectly normal children are born to mothers over forty, and there is no evidence to show that such children were weaker physically or mentally than those of preceding pregnancies. In about 50 per cent. of Mongols the child was the last of a series, but it might be between two normal children or be the first child. Adverse conditions

affecting the maternal reproductive organs might possibly act as predisposing, but they could not be the essential cause of Mongolian imbecility. Again, pressure on the basal ganglia as shown by the short anteroposterior diameter of the skull, the flat occiput, and the diminished weight of the cerebellum, pons, and medulla had been given as causes of this condition. Here there was a possibility that there had been confusion of cause and effect. Congenital syphilis had been suggested as a cause of Mongolian imbecility. The investigations of twelve authors, representing a study of 3,872 cases of mental defectiveness, found 9.1 per cent. giving positive Wassermann reaction. There seemed to be no definite relation between syphilis and Mongolian imbecility either as regards the Wassermann reaction or the clinical evidence of the disease. Shuttleworth found clinical evidence of syphilis in only 4 of 350 cases. While frank cases of congenital syphilis were common he did not remember seeing a single case which presented the manifestations of Mongolian imbecility. On the other hand during the last eighteen years he had had over 100 cases of Mongolian imbecility under observation. Granted that in a few the disease was latent, if there were a casual connection, we would expect some to show distinct lesions. When there was a syphilitic infection in a family, the first children usually presented marked manifestations, and the severity of the symptoms tended to diminish with each pregnancy; in Mongolian imbecility it was frequently the last child and the last child only which was affected. Stevens thought it probable that syphilis acted primarily on some of the endocrine organs, possibly the pituitary body, though the characteristic facies might occur independent of an involvement of the endocrine organs. It was true that disturbance of the pituitary body might cause changes in the bones of the skull and face, but not all such changes were necessarily due to lesions in that organ. The dwarfing in Mongolian imbecility was not usually marked and was not to be compared with that in congenital absence of the thyroid gland. In some of the writer's patients it was not so great as that associated with conditions which were quite independent of primary disturbance of the ductless glands, such as congenital heart disease and the intestinal infantilism of Herter. Postmortem examinations in Mongolian imbeciles had not shown any characteristic changes in the thyroid, thymus, or suprarenal bodies. The administration of these extracts in Mongolian imbeciles had not been followed by marked improvement.

There was one feature upon which more emphasis should be placed, namely, the frequent association of Mongolian imbecility, with other congenital anomalies. Besides the more common ones, congenital heart disease, strabismus, and anomalies of the palate, ears, fingers, and toes, Dr. Herrman said he had also had 2 cases of congenital cataract under his observation. There were comparatively few of these patients who did not show some anomaly. Many of these deformities were known to be inheritable according to the Mendelian laws; many others were probably transmitted in this way. Was it not plausible that the association of these anomalies with Mongolian imbecility in the same individual was not merely a coincidence, but that the peculiarities of the brain, skull and face were dependent on similar causes, and that they were also inheritable according to the Mendelian principles? According to these principles a "carrier" might be defined as an individual who had within him the peculiarity or unit character in a concealed, latent, or recessive form so that although apparently normal, he might transmit this characteristic to his offspring. He was not unlike the "carrier" in the communicable diseases who, although free from the disease himself, might transmit it to others. Goddard's graphic charts showed that the Mendelian theory had proved true as regards feeble-mindedness. The chart showed why a feeble-minded child only resulted when a carrier mated either with a feeble-minded individual or one carrying the same unit character as himself. Thus we saw why there was greater danger in the mating of cousins, if there were a defect in the ancestry, because having grandparents in common there was more likelihood that they were both carriers, though they might appear perfectly normal. Goddard did not include Mongolian imbecility in the hereditary form of feeble-mindedness, but thought its sole and adequate cause was in the condition of the mother during pregnancy, yet it had already been shown how unlikely it was that the condition of the mother was responsible.

All observers had pointed out the difficulty of getting complete and accurate pedigrees. Dr. Herrman reproduced two pedigree charts of families with polydactylism. The first was that reported by Smith and Norwell (*British Medical Journal*, 1894, Vol. II., p. 8); the second by Struthers (*Edinburgh Journal*, 1863, Vol. XXVIII., p. 83). This was an anomaly which would hardly escape notice even though the child lived,



only a few days, and there could be no reason for concealing the fact that such a deformity had occurred, and still the two charts showed the greatest difference in demonstrating that polydactylism was an inherited unit character. Two charts of Goddard's, an original and a revised form, showed how easily erroneous conclusions might be based on the original data. It must be remembered that abortions, still-births and deaths in early infancy, frequently occurred in the family history of Mongolian imbeciles, so that it was not at all unlikely that such a case was occasionally overlooked or unrecognized. In the 300 feeble-minded investigated by Goddard, 66 per cent. were classed as hereditary or probably hereditary, while only 11 or 3.6 per cent. were Mongolian imbeciles. These relative percentages corresponded well with those given by other authors, so that hereditary feeble-mindedness as classified by Goddard was about eighteen times as common as Mongolian imbecility. It was therefore not surprising that the pedigree charts of Mongolian imbeciles should not indicate inheritance so frequently or so distinctly. The probability of the mating of two carriers of this unit was much less than of two individuals who were carriers of simple feeble-mindedness. It must also be remembered that one positive pedigree was more convincing and valuable than several negative ones. In one of Goddard's families and in three families which have come under the writer's observation there were two Mongolian imbeciles. Shuttleworth, Stevens and Hjorth (twins) had also reported such cases.

There was no positive evidence that worry, emotional shock, illness during pregnancy, or congenital syphilis were important or essential factors in the causation of Mongolian imbecility. The evidence that Mongolian imbecility was a unit character and recessive, although not conclusive, was suggestive.

DR. CORA M. BALLARD said her observations in families in which there had been Mongolian imbecility was that in every branch of those families the majority of the children had various stigmata of degeneration. She said she could bear out Dr. Herrman's conclusions.

DR. EDDY said he did not think Dr. Herrman had proved much, because in looking through a family in other conditions one almost always found some defect somewhere along the line. The mere association of Mongolian imbecility with those defects did not seem to him to prove anything.



DR. WILLIAM B. NOYES said that Dr. Herrman did not mention hyperthyroidism and yet this condition was often marked in Mongolian imbecility. Many instances of cures were reported when thyroid extract was first used. This had been more recently tested out in Vineland, and while the hypothyroidism might be improved the main condition of Mongolism remained unchanged. In general Mongolian imbecility was a condition in which several stigmata of degeneration were in evidence in a definite and recurring combination in a low-grade imbecile. Not all were present in every case. The slanting eyes, the brachycephalic head, the fissured tongue, short, pudgy or pointed fingers with the little finger abnormally short and crooked, were constant. Congenital heart disease and hypothyroidism were frequent. Sometimes two or three of these defects were present in a case distinctly not a Mongolian imbecile. The mentality might reach that of a high-grade moron in rare cases. The figures quoted by Dr. Herrman were certainly quite convincing and the association with the laws of heredity on Mendelian principles quite convincing also. The syphilitic origin as worked out in the Stevens list appeared plausible, but had not been confirmed in the cases seen in the Mental Clinic of the Department of Charities except in a few isolated cases.

DR. CHARLES HERRMAN said that, with regard to the questions of toxemia as a factor in the causation of Mongolian imbecility, he did not see how any toxemia could produce alternately a normal child and a Mongolian imbecile, nor could he see how it would be possible for a toxemia to affect only one of twins. He could not conceive of the two germ cells in the case of twins one of which was affected by the toxemia of the mother and the other not. With regard to hypothyroidism and Mongolian imbecility, there was a time when these two conditions were confused, but they had come now to recognize them as two distinctly different conditions. There was no doubt that in some cases of Mongolian imbecility a slight improvement had been brought about by thyroid medication. Some years ago Siegert reported what he then considered a case of cretinism with a normal thyroid postmortem; after studying the case he finally retracted what he had said and decided that it was a case of Mongolian imbecility. While in a few instances there might be slight improvement after the administration of thyroid, such improvement was not marked permanent. As to the fissured tongue, there

was a simple question of sucking, excessive sucking produced a prominence of the papillae and then fissures. As to the last argument that there were defectives in all families, it might be said that their evidence here was cumulative and in time they might get enough to prove the position he had taken. They had heard in one instance of first a normal child and then a Mongolian imbecile having been born in one family and there were many defects in this family, among them three instances of congenital myasthenus and a case of deaf mutism.

DR. ABRAHAM JACOBI read a paper on "The History of Pediatrics in New York, III." (March ARCHIVES.)

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SPINAL FLUID IN MONGOLIAN IDIOCY—In a previous paper, H. C. Stevens (Journal American Medical Association, 1916, Vol. LXVI., p. 1373) presented results which he claimed indicated, with a high degree of probability, that the condition known as Mongolian idiocy was one of the manifestations of congenital syphilis. That conclusion was based on serologic tests which were made on the blood serum and the spinal fluid of 21 Mongolian idiots. In a second series of 18 cases he now finds that the Wassermann reaction on the blood serum of Mongolian idiots was positive in 33 per cent. of the cases. The Wassermann reaction on the spinal fluid was positive in 11.1 per cent. Pleocytosis was present in no case, except in the two already mentioned, in which blood was present. The globulin content was increased in 100 per cent. The gold chlorid reaction was present in 100 per cent. of the cases. The color changes of the gold chlorid reaction were typical of cerebrospinal syphilis. While the serologic tests seem to demonstrate that this condition is a result of syphilitic infection, it is not, however, to be considered a form of frank cerebrospinal syphilis. The characteristic facies of the Mongolian syndrome and the dwarfing of the body make it appear probable that the syphilis acts primarily on some of the endocrine organs, possibly the pituitary body. Studies of the metabolism of groups of Mongolian idiots show a high degree of sugar tolerance and calcium retention.—*American Journal of Obstetrics.*

## DEPARTMENT OF ABSTRACTS

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### ORIGINAL CONDENSATIONS OF CURRENT PEDIATRIC LITERATURE BY THE EDITORS AND THE FOLLOWING ASSOCIATES

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Raymond B. Mixsell....Pasadena, Cal.	J. Herbert Young.....Newton, Mass.

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GORDON, ALFRED: THE VALUE OF THE WASSERMANN REACTION IN CASES OF MENTAL DEFICIENCY IN CHILDREN. (*The Child*, March, 1917, p. 291.)

The 78 children studied by the author, especially from the standpoint of hereditary syphilis, presented mental defects of various degrees. We observe that 50 per cent. of these subjects presented a positive serum reaction, and in the 17 cases in which the spinal fluid was obtained also, the Wassermann tests ran parallel in both, except in 3 cases of feeble-minded children with functional nervous disorders. The author urges in every case of involvement of the central nervous system in childhood a Wassermann test of the blood, and, if possible, also of the spinal fluid. In case a single negative result is obtained the test should be repeated at various intervals. Vigorous and prolonged anti-syphilitic remedies were instituted. JOHN B. MANNING.

FORBES, HENRY HALL: ACCIDENTS IN BRONCHOSCOPY. (*Annals of Otology, Rhinology and Laryngology*, December, 1916, p. 845.)

Removal of foreign bodies from the respiratory passages is an operation of much more frequency in children than in any other class of patients; it requires great skill and but few of the men now working in diseases of the nose and throat seem inclined to spend the necessary time or have the opportunity to see the number of cases that would make them experts in this line. In this article the author quotes sixteen incidents where

an accident has happened while children were under operation or instrumentation and these accidents happen in one of three stages: (1) During the stage of anesthesia, (2) during instrumentation, and (3) during the postoperative period. In the first stage a foreign body may change its position and cause sudden dyspnea or disappear from its original position and have to be searched for or the anesthetic may be taken badly. Under the second stage there may be sudden cessation of respiration due to the presence of the instrument; one bronchus may be obstructed by the foreign body and the passing of the instrument may obstruct the other, thus shutting off the lung entirely; while attempting to remove a body, it may slip from the instrument and lodge in a new position; the instrument may be passed through the wall of a bronchus or the esophagus, especially where there is a malignant growth present. During the postoperative stage laryngeal edema may occur and this especially in children; pneumonia may follow. The greater number of fatalities occurred in cases where the operator's total number of cases were less than three.

SAMUEL W. THURBER.

STONE, J. S.: FRACTURES OF THE EXTERNAL CONDYLE OF THE HUMERUS IN CHILDHOOD, WITH ROTATION OF THE CONDYLAR FRAGMENTS. (Boston Medical and Surgical Journal, February 1, 1917, p. 151.)

Epiphyseal separation of the external condyle of the humerus in childhood is a definite type of fracture which demands prompt open reposition of the fragments when the epiphyseal fragment has become rotated in such a way that the slightly cup-shaped fractured surface faces outward and usually slightly upward and backward. This can be felt beneath the skin and can be recognized by the clear-cut edges and the slightly depressed center. The rounded joint surface lies more or less in contact with the epiphyseal line or fracture surface of the shaft, or with the outer anterior surface of the bone just above the fracture surface. A space is found between the shaft of the humerus and the head of the radius, where the epiphyseal fragment normally belongs, which space is filled with a blood clot. New bone grows down from the fractured end of the humerus to partly fill the space. It may come in contact with the synovial surface of the fragment, but there is no union. Free movement of the joint is thus mechanically obstructed.



The treatment advised is open incision, exposure of the fragment, removal of the clot and the prying of the fragments into normal position. Acute flexion locks the fragments into place and this should be maintained for a fortnight.

CHARLES E. FARR.

DOWNNEY, JESSE W., JR.: A STUDY OF ONE HUNDRED CASES OF MASTOIDITIS AND ITS COMPLICATIONS REQUIRING OPERATION. (*Annals of Otology, Rhinology and Laryngology*, December, 1916, p. 994.)

In this report 46 per cent. of the cases were in children under ten years of age. The mortality was 10 per cent.; the cause in 3 cases was septic meningitis; 2 cases, cerebral abscess; 3 cases, cerebral tuberculosis; 1 case, septicemia with scarlet fever and 1 case of pneumonia.

Given a patient with a discharging ear which shows granulations or polypi and who begins to complain of headaches, vertigo and nausea, a radical mastoid operation should be advised. The author states that there should be no mastoid tenderness or fever after three days of free discharge in a case of acute otitis media. Secondly, the case should yield to treatment and the discharge cease within ten days; persistence of symptoms beyond this time means mastoid involvement and probable operation. In infants, tenderness over the mastoid is difficult to elicit, but edema, which may extend above the ear, is more frequently seen than in adults. There may be also slight enlargement of the periauricular glands. The temperature is usually higher and the otorrhea more marked than in adults. The leukocyte count is also higher.

The rest of the article deals with the operation itself.

SAMUEL W. THURBER.

McKNIGHT, H. A.: CONGENITAL LOBSTER-CLAW DEFORMITY. (*Medicine and Surgery*, March, 1917, p. 30.)

McKnight reports a case, one of twins with normal brother. There are but two toes on each foot extending to the carpal articulation. The functional capacity is fair, though the gait is waddling. The great toe on each foot consists of a single row of bones and is tipped by one nail, while the fourth and fifth toes are syndactylized throughout their entire length and reveal on palpation two rows of bones, and have double nails at their extremities. The right hand has only four fingers, with a

slightly opposable digit, which can be differentiated as a thumb, since it has but two phalanges. The third digit is suppressed, but a third metacarpal can be felt on palpation. The left hand is markedly deformed and has the typical appearance of a lobster's claw. The fifth finger is normal, the fourth is thickened, and at the web seems to be built up of two bones arranged in a triangular fashion. The second and third fingers are represented by a mass of soft tissue extending slightly beyond the normal line of the metacarpophalangeal articulation. The thumb is an irregular mass of soft tissue about 4 cm. in breadth, divided on the ulnar side into three teatlike processes representing fingers, two of which have nails at their distal ends. The author shows pictures and skiagrams of the hands and feet. McKnight has found more than 180 examples in the literature of similar cases reported. He thinks all these cases are probably from a common ancestor, who was probably a sport and not an atavistic reversion.

MILLS STURTEVANT.

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#### A NEW PUBLICATION

ARCHIVES OF PEDIATRICS takes great pleasure in welcoming to the field of medical publications the new Journal, *Annals of Medical History*. This is to appear in four quarterly issues and will include original contributions on historical medicine, with occasional reprints of various epoch-making monographs. The Editors feel that there is a great need for such a publication, especially as so few men have the opportunity to spend sufficient time in libraries, if indeed there is one in their town, in digging out for themselves facts of value in medical history. Original articles in the first issue include the following: "The Scientific Position of Girolamo Fracasastoro" (1478?-1553) with especial reference to the source, character and influence of his theory of infection, by Charles and Dorothea Singer, Oxford, Eng.; "The Greek Cult of the Dead and the Chthonian Deities in Ancient Medicine," by Fielding H. Garrison, M.D., Washington, D. C.; "Voltaire's Relation to Medicine," by Pearce Bailey, M.D., New York; "Burke and Hare and the Psychology of Murder," by Charles W. Burr, M.D., Philadelphia, Pa.; "Hebrew Prayers for the Sick," by C. D. Spivak, M.D., Denver, Col.; "Laryngology and Otology in Colonial Times," by Stanton A. Friedberg, M.D., Chicago, Ill.

# ARCHIVES OF PEDIATRICS

JUNE, 1917

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PUBLISHED MONTHLY BY E. B. TREAT & CO., 241-243 WEST 23D STREET, NEW YORK

## ORIGINAL COMMUNICATIONS

### THE EARLY RECOGNITION OF POLIOMYELITIS \*

By ROYAL STORRS HAYNES, M.D.  
New York

That the problem of the early recognition of poliomyelitis is important need not be emphasized in any such gathering of physicians as this. The epidemics of recent years, particularly that of 1916, have shown all of us the need for adequate handling of such epidemics. And adequate handling of such epidemics can be had only through a thorough understanding of the problems involved and an early recognition of cases as they arise. The fear of what the coming summer will bring us in the shape of poliomyelitis and where it will bring it should prove a stimulus to the study and the preparation of all means for prevention and cure.

\* Read before a joint meeting of the Philadelphia County Medical Society and the Philadelphia Pediatric Society, May 23, 1917.

Early recognition is just as necessary in poliomyelitis as it is in other infectious diseases which occur in epidemic form if we are to save the stricken individual and adequately protect the invaded community.

It is a far cry to the day when poliomyelitis was regarded as an occasional disease of childhood in which the individual suffered from a flaccid paralysis in the distribution of the lower motor neurone. The epidemics in Northern Europe and in this country first opened the eyes of many of us to the fact that the disease is one of communities and not of individuals.<sup>1, 2</sup> The observation of a large number of cases of "*infantile paralysis*" developed the information that the disease not uncommonly affects others than children, that the commonly accepted type of the disease was but one of several varieties and that the disease might prove fatal. By so much was our picture of the disease enlarged. So, too, did the study of epidemics bring forward the question of whether or not poliomyelitis was in essence a disease of infectious origin. The early epidemics showed that alongside of cases of the paralytic or the more newly recognized cerebral and meningitic forms of the disease there were certain cases which progressed up to a certain point in identical fashion but which did not develop any of the severe nervous symptoms or paralyzes and which recovered. These so-called "*abortive*" cases were recognized with considerable frequency and the addition of this class of cases widened the view greatly.

Then came the contributions of laboratory workers all over the world—notably, in this country, Flexner, Lewis, Clark, Noguchi and others. This work established the infectious character of the disease by transferring poliomyelitis to monkeys and identifying the experimental poliomyelitis of monkeys with the epidemic and sporadic disease occurring in man.<sup>3</sup> Thus the infectious agent could be studied and the mechanisms by which it invades the body and thrives there.

These studies, continued to the present time, have established the identity of the infecting organism and with it fulfilled Koch's postulates.<sup>4, 5, 6, 7, 32, 33</sup> They have discovered the points of ingress to the body,<sup>2</sup> the manner in which the virus is distributed throughout the body,<sup>2, 8, 9, 12, 10</sup> the lesions it causes in the viscera and the central nervous system,<sup>2, 8</sup> the tissues of the body for which it shows particular predilection,<sup>12</sup> and the manner in which they are defended against its attack.<sup>9, 11, 13</sup> These studies



have disclosed the development of immunity principles in the blood of man and monkey and devised a test for their existence in the blood serum.<sup>14, 15, 17</sup> These studies have shown that the infectious material has egress from the body through the nasal mucous membrane and the intestinal tract;<sup>14, 19, 16</sup> that insects may be passive carriers of contagion and that human beings, themselves well, may yet transmit the disease.<sup>18, 19</sup>

Contributions of clinical workers have laid down data as to the constitution of the blood and the spinal fluid in the disease,<sup>20</sup> establishing the distinctiveness of the spinal fluid and its value in diagnosis.<sup>2, 8, 21, 22</sup> By this means and a close observation of symptoms, they have correlated with the paralytic more and more of the non-paralytic cases and have given us a more or less characteristic clinical picture by which we may recognize them thus moving our point of diagnosis earlier in the unfolding of the disease.

Epidemiologists have investigated the occurrence of the disease and contributed much information of a nature confirmatory of the findings of the laboratory worker and the clinician. Their problem has been the more confused because it has been and is so difficult to bridge the gaps between cases in epidemics where contacts and the movements of individuals are so obscurely interwoven. They have shown that the disease travels along the lines of human contact<sup>2, 8, 16, 23, 24</sup> and that animals and insects play no part in it except as they are passive conveyers of the infectious material.<sup>25</sup> The existence of an animal "reservoir" of the disease, and the relationship of animals and insects to the occurrence of epidemics has not yet been satisfactorily settled, pro or con. A solution is delayed by the fact that there is no standard for the recognition of this disease among animals except the production of lesions of spinal cord and brain similar to those occurring in monkeys and man. It is possible that the infecting organism of poliomyelitis may produce other signs and lesions among lower orders of mammals, among whom the disease may exist in a form which keeps alive the contagium, permitting of a new invasion into the higher orders at times of epidemics the animals themselves not being ill, as is the case with the goat and Malta Fever, and the antelope and trypanosomiasis.<sup>26</sup> A high immunity conferring power may some day be found in such an animal or an attenuated virus of adequate immunity conferring power as is seen in diphtheria on the one

hand and vaccinia on the other. The work of Marks and M. J. Rosenau is suggestive along these lines.<sup>26, 27</sup>

The knowledge we possess of poliomyelitis is extensive and has been part of medical literature, some of it for a number of years. It has seemed, therefore, that the generally confessed ignorance which was so prominent a part of the lay and medical writings last summer was unnecessary; it was the ignorance of not having used the knowledge available. It created greater alarm on the part of the general public than was necessary or right. Even imperfect as the knowledge claimed was, it was quite as great as that we possess of scarlet fever over which disease we seldom become hysterical.

The epidemic of 1916 brought into prominence, what was already known with reasonable certainty, namely, that the well-appearing sufferers (if they can be so called) of poliomyelitis probably equal in number those who are manifestly ill with the disease; and that the disease exists in stages comparable to the generally accepted course of such a disease as measles or small-pox, namely, an incubation period, a period of early symptoms, a latent period, and a period of invasion. This evolution of the disease in two periods noticed in Swedish epidemics<sup>2, 23, 24, 28, 8</sup> has recently been very carefully elaborated by Draper under the name of the "two humped course" of the disease.<sup>29</sup>

It is interesting in connection with our present idea of poliomyelitis to see how practically all the facts concerning the infectiousness of the disease, its manner of transmission, etc., were demonstrated in the study of an epidemic sufficiently small to be examined in toto, and sufficiently isolated so that the threads of contact did not become snarled.

Kling and Levaditi, in 1911,<sup>24</sup> studied a small epidemic of poliomyelitis in two islands on the East coast of Sweden, Djurso and Yxno. Here the population was small, confined, partly closely associated, partly not. What travelling was done could be noted. The effect of attendance at school, of common food supplies, of milk, of water, of insects, could be carefully estimated. This is a most interesting study and well repays careful reading. By this study, certain facts were shown which had, one here, and another there, been noted in the epidemiological studies of poliomyelitis of other observers; but perhaps never so completely shown or with so many correlated facts. It was established:

(1) the probability of the introduction of the disease by an immune carrier;

(2) that the incubation period of the disease is usually short, one, or two, or three days;

(3) that the illness is ushered in by a group of symptoms which may be so insignificant as to be quite overlooked; that this may be all and yet the serum of such an individual may prevent or retard the experimental disease in monkeys; that these early symptoms may be sharp and severe;

(4) that the initial symptoms are followed by a period of good health of one to three days' duration usually; but exceptionally of a duration of several weeks;

(5) that a second group of symptoms may then follow which are almost always chiefly referable to the nervous system; that these may result in complete recovery, or paralysis or death;

(6) that when contact between persons is close, as in families, most or all members have an illness of sorts which may take any form of poliomyelitis or coryza, angina, diarrhea, vomiting, headache, fever, or dizziness of any grade of severity;

(7) that when contact between persons is short, or not close, even if the same house be occupied, or adjacent seats in school, communication of the disease is unlikely;

(8) that where there is no contact between individuals there is no disease;

(9) that the use of milk, food supplies or water in common may not result in transmission from a sick person even to an individual of susceptible age;

(10) that infectiousness may be present in the individual before the onset of any symptoms, *i.e.*, in the incubation stage;

(11) that infectiousness may persist after the subsidence of the prodromal symptoms for several weeks, during which the individual may be well;

(12) that of a population in contact with poliomyelitis about 50% will show signs of illness, of whom again 50% or less will have nervous symptoms;\*

(13) that all ages are affected; about 65%\* being under 16;

(14) that when poliomyelitis is introduced into a community it tends to spread rapidly to all susceptible persons, do its utmost and cease abruptly;

(15) that in a community there are families apparently immune, and among families, persons immune;

\* Figures correct only for this epidemic, suggestive for others.

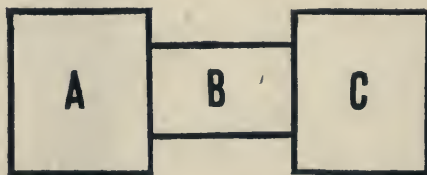
(16) that a forced and complete cessation of contact quickly suppresses the disease.

From these facts it becomes increasingly evident why early recognition of poliomyelitis is necessary to proper prevention of the disease. The early infectiousness, the rapidity with which the disease spreads in the community, the comparative insignificance of the symptoms in many persons who yet may transmit the disease, and the transmission of the disease by well-appearing persons, all make an early recognition necessary so that control may be gained over as many contacts as possible, and all contacts prevented that can be prevented.

In the treatment of any disease it is important to put the patient into the best possible position to meet his illness at the earliest possible moment, this without any regard of the actual method of treatment. The avoidance of strain, fatigue and trauma in the case of poliomyelitis is particularly important as preventing so far as possible any injury to the cerebrospinal axis which might break down the mechanisms of defense and permit a more rapid or wider invasion of the nervous system. So many acute onsets of paralysis follow distinct evidence of trauma that there must be some precipitating effect of injury upon an already infected person. (Of course, the subjective sensation of having been hit in the back, is one commonly complained of, and this should be borne in mind.) Further, for the actual curative treatment of any disease, early application of the cure, particularly a specific cure such as the use of immune serum, results in the need for less of the curative agent because less injury presumably has been done.

How then are we to recognize poliomyelitis?

We may refer to a scheme of the course of this disease such as the following:



in which the stage A represents the period of incubation and early symptoms, B the latent period, the period of lull



(*d'accalmie, Kling*), and C the stage of invasion with symptoms of involvement of the nervous system, paralysis or death.\*

Such an arrangement probably underlies all cases of the disease as is indicated by the behavior of the virus of the disease after its entrance into the blood, first localizing itself in the spleen and bone marrow before or until the choroid plexus line of defense is broken through and the cerebrospinal system is involved. It is analogous to what obtains in small-pox where the invasion of the blood by the organism is followed by constitutional symptoms which subside when the virus finds its localization in the tissue of predilection, the skin, only to arouse again when its action there produces the typical reaction of the eruption. In some cases the stage A may be too trivial to be noted, and B may be so short as to be entirely overshadowed by a fulminating onset of C. In others, C seems to fail to appear and the disease apparently stops at A. Whether it really stops there and immunity is acquired without actual involvement of the nervous system, is not, I think, yet demonstrated. In still other cases, A may be severer and present symptoms ordinarily referable to the nervous system, but due possibly only to a general reaction to the poliomyelitis protein. This case may look like an abortive case with recovery. B here may be so long that the final occurrence of C makes this group of symptoms and paralysis seem like a relapse. (Such a case was that of Esther Sven in Kling's epidemic.)

We see, then, that our problem will vary with the different stages of the disease. In A the individuals are ill with a variety of complaints, most of them trivial and many times forgotten. If that is all that occurs we cannot recognize it nor know what members of the community have passed through it and have acquired an immunity until some diagnostic test along the lines of the Wassermann, the Widal, the von Pirquet or the Schick shall have been devised and made readily and inexpensively applicable.

Even when the symptoms of stage A are made known and suspected of relationship to poliomyelitis as may be the case during an epidemic, or as probably should be the case when the patient is a child and the season is summer, there is nothing about the symptoms, nor the spinal fluid, nor the blood which

\* (June 25) A similar schematic representation of the disease, somewhat more comprehensive, is contained in Draper's article and book, recently published. (See also p. 479.)

is characteristic, so far as is yet known. The observation of Zingher<sup>31</sup> that cases of poliomyelitis practically uniformly are susceptible to the toxin of *B diphtheria* as shown by the Schick reaction, would serve only to indicate that the person with a positive Schick might, with probability, have poliomyelitis, and the person with a negative Schick as probably would not. That is all, and the test is slow, slower than often the interval from A to C.

The symptoms of stage A are almost anything, but commonly are the following:

Headache and fugitive pains;  
Feverishness and restlessness;  
Vomiting or diarrhea;  
Sorethroat or coryza;

in short, the symptoms of a mild indigestion or gripe.

In the stage B, again poliomyelitis will not be recognized unless stage A is suspected. If it is suspected and a lumbar puncture is done, the fluid will be clear and appear normal in amount with perhaps a few more than the normal number of cells. Here the colloidal gold reaction is positive, and is sufficient, according to Jeans,<sup>30</sup> to differentiate between poliomyelitis and any condition giving a normally appearing cerebrospinal fluid, such as meningismus. It is very difficult, however, to tell when in the disease cycle B ends and C begins, as regards the spinal fluid.

In the stage C, which is the period of symptoms commonly regarded as the whole disease, we have the well-recognized problem of determining the existence of a clinically developing poliomyelitis. However, if we wish to recognize it early, as we deem important, speed in arriving at our conclusion is necessary. It is more than a matter of academic interest and professional pride to recognize that the illness is poliomyelitis before the advent of paralysis, for if our methods of treatment are, as they seem to be, like the use of antitoxin in diphtheria, doubly efficacious if applied quickly, the matter of a few hours in knowing what we confront will make all the difference between a non-paralytic poliomyelitis and a paralytic poliomyelitis. Furthermore, the same haste is of advantage in regard to the question of quarantine and so in regard to the treatment of the community.

If the patient is still infectious we aim to prevent further contact with susceptible persons and to isolate his contacts so that they, if they develop the disease, may not spread it further.

The recognition of poliomyelitis early in the preparalytic part of stage C depends upon the history of the attack, upon certain findings of physical examination and the findings of the laboratory, particularly in regard to the spinal fluid.

The symptoms are those of

(a) General constitutional disturbance, fever, accelerated pulse, anorexia, prostration.

(b) Pain and hyperesthesia.

(c) Symptoms referable to the irritation of the spinal cord, as stiff neck, Kernig, alteration of the reflexes, tremors, fibrillary twitchings of muscles, paresis of certain groups.

(d) Symptoms referable to irritation of basal ganglia and cranial nerves, as difficulty in swallowing, facial paralysis.

(e) Symptoms referable to cerebral cortex, dullness, drowsiness or excitement and even convulsions.

Not all of these symptoms are common enough nor significant enough to help in the early recognition of poliomyelitis. Certain of them, however, are distinctly helpful and constitute a pretty typical picture.

The onset of symptoms is commonly *abrupt*. *From a state of health, or of well-being subsequent to a slight illness* (representing A), *the child becomes really and quickly ill*. This onset is commonly accompanied by *vomiting* and always by *fever*. The fever, per se, except it may be very high, has no distinguishing characteristics nor have the pulse or other general symptoms of illness.

The child presents a mental state of greater or less *drowsiness* from which, when he awakens, he emerges irritable. He is from the beginning *hyperesthetic*. He cries whenever he is touched, even by his mother, who often notices this as she tries to give him a spoonful of food or medicine or to change a diaper. He cries even when the bed is jarred. He may have actual spontaneous pain in head, or neck, or back, or extremities, but the hypersensitiveness to handling is most impressive. He holds his head more or less retracted and his body may assume a position of partial opisthotonos so that he does not lie on his back but on his side with his legs straight out. Anything that produces anterior flexion of his vertebral column he resists because such

flexion is exquisitely painful. When a child in this stage is held up by neck and buttocks he tends to arch his body and to throw his head back. Kernig's sign may be elicited. There may be a tenderness on pressure along the spine or in muscle groups. This hyperesthesia on pressure and bending is to be regarded as one of the cardinal symptoms of the beginning of an attack of poliomyelitis and has been commented upon by many as Wickman, Müller, Kling, Peabody, Draper and Dochez, Ruhräh,<sup>35</sup> etc. It is the so-called "spine sign" and one of great value.

Muscular weakness such as the inability to hold up the head for more than a short interval, tremors in the extremities, particularly in the fingers and occurring in series of attacks, and fibrillary twitching of muscles, are important corroborative evidence. Facial paralysis may occur so early as to be in this group for the cases where it occurs early and alone are curiously likely to get well.

Alteration of the tendon reflexes is of value, first in the way of distinct variation between the knee jerks, for instance, and then slight distinct diminution in the activity of a tendon reflex, an early sign of involvement of that muscle group.

The sudden development of *fever, drowsiness, headache, or hyperesthesia* (particularly the presence of the spine sign), muscular weakness, tremors or fibrillary twitchings, an inequality or diminution of tendon reflexes constitute a complex which calls for lumbar puncture even without more pronounced meningeal symptoms. In poliomyelitis, at the time when such symptoms are present, the spinal fluid is distinctive.

The characteristics of the spinal fluid in poliomyelitis are now so well established<sup>2, 8, 21, 34</sup> as hardly need to be recalled to your attention. The fluid is usually under tension, which diminishes somewhat after the first 12 to 24 hours. It is clear or slightly hazy; in it on standing a fine thread may form. The cells are increased in number (sometimes at this time above 1,000) and almost invariably mononuclears. Albumin and globulin are present, the globulin increasing in amount as the process progresses; a sugar reducing substance is present. The Lange colloidal gold reaction gives a positive reaction. The fluid is negative, bacteriologically, on smear or ordinary culture.

With the sudden onset of characteristic symptoms plus a distinctive spinal fluid, a diagnosis may be made within 12 hours of the beginning of stage C at a time ripe for successful treat-



ment. Of course one must realize that paralysis may be the first sign of the disease which comes to our attention and that everything up to that point may have escaped observation, or that no signs allowing of recognition have occurred. At such times early recognition is impossible, for although we seem to be at the very beginning of the illness, as a matter of fact it is probably late in the pathological process.

It is important, then, in the summer to regard any illness of a child, however slight it may seem, as a possible early stage of poliomyelitis. It is important to protect such a child with more than ordinary care from fatigue or injury during the 3 or 4 days which immediately follow after the subsidence of this illness, and to continue careful observation. Then, when there is a renewal of symptoms in such cases as are poliomyelitis, the characteristic signs and symptoms may be observed at their inception, a lumbar puncture performed, a diagnosis made early, and whatever means are available for cure or prophylaxis instituted immediately.

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D'ESPINE'S SIGN IN CHILDHOOD—Because of the difference of opinion which prevails as to what constitutes d'Espine's sign, J. L. Morse (*American Journal Diseases of Children*, 1916, Vol. XI., p. 276) investigated a series of 666 private cases. In 626 of these children, or 94 per cent., the change in the voice sound occurred between the seventh cervical and the first dorsal spine. The following conclusions seem warranted from the study of these cases: D'Espine was correct in his original contention that the normal change in the voice occurs between the seventh cervical and the first dorsal spines. D'Espine's sign is present, therefore, when the bronchial voice, or whisper, is heard below the seventh cervical spine. D'Espine's sign is uncommon in children of the well-to-do classes. When it is present in them, it is probably not a manifestation of tuberculosis in more than 50 per cent. The presence of this sign means merely that there is some tissue between the trachea and bronchi and the vertebral column which transmits the bronchial sound unchanged, whereas under normal conditions it is modified during its transmission. This tissue is ordinarily made up of the enlarged tracheo-bronchial lymph nodes. The enlargement of these nodes may or may not be due to tuberculosis.—*American Journal of Obstetrics*.

# THE CEREBROSPINAL FLUID IN ACUTE ANTERIOR POLIOMYELITIS, WITH SPECIAL REFERENCE TO DIAGNOSIS \*

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Since acute anterior poliomyelitis may produce atypical and misleading symptoms and escape clinical detection, many investigators have sought to discover some clinical or laboratory test specific for this infection and particularly in the early stages of the disease, not only because early diagnosis may have an important bearing upon the relation of the disease to public health, but particularly by reason of the recent observations indicating that the prompt and proper administration of serum from human convalescents may prevent the onset of the dreaded paralysis or at least limit its degree and extent. Despite the large amount of laboratory investigation conducted with this primary object in mind, a specific test for acute poliomyelitis in the early stage or indeed for any stage of the disease, has not been discovered, although valuable information has been secured which when applied to the individual case may be of distinct aid in diagnosis.

Common experience has shown that in all the acute infectious diseases early and specific diagnosis is only possible when the specific microparasite can be demonstrated without undue delay, and this is not possible in acute poliomyelitis. The fundamental experiments of Flexner and Lewis,<sup>1</sup> Landsteiner and Levaditi<sup>2</sup> and others have proven that the disease is of microbic origin and the globoid bodies cultivated by Flexner and Noguchi<sup>3</sup> from tissues of the central nervous system of fatal cases have the strongest claim as being the etiological agent of the disease, but none of the methods employed for demonstrating the presence of the virus or globoid bodies are adapted for diagnostic purposes. While experimental evidence teaches that

\* From the Laboratory of the Philadelphia Hospital for Contagious Diseases. Paper read in the symposium upon acute anterior poliomyelitis before the conjoint meeting of the Pediatric and Philadelphia County Medical Societies, May 10, 1917. The work upon which this paper is based was instituted in the laboratory of the Philadelphia Hospital for Contagious Diseases and continued in the laboratories of Pathology of the University of Pennsylvania, with the co-operation of Dr. Allen J. Smith, Dr. Chas. K. Mills, and others, as a part of a series of investigations bearing upon the pathology and clinical aspects of poliomyelitis.

one portal of entry of the virus is the mucous membrane of the upper respiratory tract and that the secretions may harbor the microparasite, a demonstration of the presence of the virus is only possible by monkey inoculation requiring many days or weeks of time, which places this test beyond the pale and scope of practical diagnosis. While the recent reports of Mathers,<sup>4</sup> Rosenow,<sup>5</sup> Nuzum and Herzog<sup>6</sup> indicated that the etiological agent of acute poliomyelitis was an easily cultivatable diplococcus or streptococcus and that indeed the diagnosis of a case may be made by culturing the cerebrospinal fluid with almost the same ease and sureness with which typhoid fever may be detected in the early stage by blood culture, it is highly probable that their reports served only to renew interest in some of the oldest bacteriological findings in the disease and have failed to establish these cocci as the cause of acute poliomyelitis. Drs. Brown, Freese and I<sup>7</sup> have found these diplococci and streptococci not only in the cerebrospinal fluid, brain and cord, but also in various internal organs of fatal cases of poliomyelitis, but all of our inoculation tests have failed to show that these micro-organisms were capable of producing the disease in rabbits or monkeys. On the other hand, these cocci have occasionally produced meningitis, arthritis, pleuritis, pericarditis and other inflammatory lesions in the experimental animals, indicating that they may possess some degree of virulence and are probably not to be classed as strictly saprophytic; furthermore the complement fixation tests conducted by Dr. Freese and I<sup>8</sup> have shown that antibodies for these cocci may occasionally be found in the body fluids of persons suffering with acute poliomyelitis and Cohen and Heist<sup>9</sup> have recently shown that the sera of convalescents and of animals immunized with these diplococci contained an increased amount of what appeared to be a specific opsonin, indicating some relationship between these micrococci and poliomyelitis analogous to the relationship of streptococci to scarlet fever. In the experiments of Bull<sup>10</sup> the lesions produce in experimental animals by streptococci cultivated from the tonsils of persons suffering with acute poliomyelitis, were entirely similar to those produced by streptococci from other sources and it would appear as definitely established that these micrococci bear no direct relationship to the etiology of epidemic poliomyelitis; while the true nature of the globoid bodies is as yet unknown and their relationship to poliomyelitis require more widespread confirmation



before being finally accepted as the cause of this disease, it is at least evident that we do not possess the one and only early and specific means of diagnosing the disease, namely, the ready demonstration of the specific microparasite. In this connection I may also mention that our experiments bearing upon the total toxicity of paper filtered cerebrospinal fluid in epidemic poliomyelitis as determined by intravenous injection into laboratory animals and particularly white rats, have failed to show any constant increase of toxicity over and above that shown by normal cerebrospinal fluid.

This being true it is natural to turn to other means of examination and diagnosis falling within the domain of the laboratory with the hope that while the earliest means of diagnosis is not as yet possible, other changes may occur as the result of the infection which may be detectable and prove of aid in the diagnosis, treatment and general management of the disease. Continuing our search for a specific test our efforts naturally center about the question of immunity in acute poliomyelitis and whether or not antibodies may be detected in the body fluids by tests analogous to the Widal reaction in typhoid fever and the Wassermann reaction in syphilis.

Here again failure has been the general rule. That antibodies are produced is shown by the experiments of Landsteiner and Levaditi,<sup>11</sup> who found that the serum of a convalescent is capable of neutralizing the virus in vitro and also by the fact that blood serum of recovered human beings is protective and probably curative in poliomyelitis, but we have no immunological reactions of practical diagnostic value. In the complement-fixation experiments of Dr. Freese and I,<sup>8</sup> in which we employed a wide variety of antigens prepared of the tissues of fatal cases of acute poliomyelitis and the sera and cerebrospinal fluids of a large number of infected persons, the percentage of positive reactions was almost negligible and in agreement with the negative results of Wollstein,<sup>12</sup> Gay and Lucas.<sup>13</sup> Recently Dr. Amoss<sup>14</sup> has reported that complement fixation and agglutination tests with human serum and the globoid bodies have yielded uniformly negative results, so that for the present, at least, we are without an immunological test of practical value in the diagnosis of acute poliomyelitis in any stage of the disease, except possibly the neutralization test which, however, in its present state, is obviously not adapted for widespread use.

Early in the history of laboratory investigations in epidemic poliomyelitis we find that efforts have been made to detect cytological and chemical changes in the blood and cerebrospinal fluid and not without encouraging and helpful results in so far as the cerebrospinal fluid is concerned. The infection does not produce any characteristic changes in the blood and an examination of the blood possesses no value in diagnosis other than showing leukocytosis as found by Le F  tra<sup>15</sup> and Peabody, Draper and Dochez,<sup>16</sup> and an increase of polymorphonuclears with a corresponding diminution of lymphocytes as is common with most of the acute infections. In the preparalytic stage the total leukocyte count has been usually within the limits of normal or but slightly increased. At best, therefore, a total and differential leukocyte count in acute poliomyelitis shows that some infection exists without furnishing data indicating the specific nature of the infection.

The most constant and characteristic changes have been found in the cerebrospinal fluid. During the systemic stage of the disease and before the virus has produced alterations in the tissues of the central nervous system these changes are usually very slight and may easily escape detection, but when the virus has reached the meninges more definite alterations in the cerebrospinal fluid may be detected and prove of aid in diagnosis. According to our present knowledge of the pathology of epidemic poliomyelitis the earliest change which has been found in the nervous system is hyperemia and the collection of numbers of small mononuclear cells, probably lymphocytes, in the perivascular lymph spaces of the blood vessels of the leptomeninges. It is worthy of special emphasis that the first change is an acute interstitial meningitis and not a surface infection associated with fibrin formation or with exudate on the surface of the meninges, as commonly found in the meningitis due to the meningococcus, pneumococcus and other micro-organisms. For this reason in acute poliomyelitis the degree of cellular and serous exudation into the cerebrospinal fluid is not usually as extensive as occurs with these surface infections and hence our methods for detecting alterations from the normal must be delicate and accurate and particularly so in the examination of cerebrospinal fluid in the prodromal stage of the disease.

Normally a few cells of the small lymphocyte variety are to be found in the cerebrospinal fluid; in each cubic millimeter the

upper limit of the normal count may be placed at 10 or 12 cells. In acute poliomyelitis the total number of cells is quickly increased so that a count of the cells in the cerebrospinal fluid has proven of distinct aid in the diagnosis of the disease. Total cell counts by Dr. Freese<sup>17</sup> of 787 fluids from persons in the recent Philadelphia epidemic have shown that in 609, or 77%, the cells were increased in number. In the majority of these fluids the increase of cells was moderate, as 80% showed counts that did not range above 100 cells per cubic millimeter of fluid. In some fluids hundreds, and indeed several thousands, of leukocytes were found, but these were exceptional cases and owing to the interstitial nature of the changes in the leptomeninges we do not expect the very high counts as commonly found in infections of the surface of the meninges as in meningococcus and pneumococcus infections. Even in the preparalytic stage a slight but definite increase in the cells is commonly found, so that the total cell count of the cerebrospinal fluid, while not specific for poliomyelitis, possesses considerable value in indicating an infection of the central nervous system and offers considerable aid in diagnosis of acute poliomyelitis, particularly when the disease is prevalent.

A study of the kinds of cells in the cerebrospinal fluid is of less value, because in acute poliomyelitis there is found no specific or characteristic cell. Very early in the disease a polymorphonuclear type of cell predominates, but these cells are quickly replaced by small lymphocytes, so that in human infections the cells in the cerebrospinal fluid are almost entirely of this variety by the time muscular weakness and paralysis are evident.

Owing to the congestion and edema of the leptomeninges it is natural to expect that substances derived from the blood serum will extravasate to the cerebrospinal fluid. Investigations have shown quite consistently that an increase of protein is commonly found during some stages of the disease. As would be expected the quantity found is not usually as great as occurs in the cerebrospinal fluid in meningococcus and pneumococcus meningitis. During the prodromal stage and very early in the paralytic stage of the disease, ordinary methods may fail to detect an increase of protein and hence the necessity for using delicate methods in this examination. In a comparative study of various methods Dr. Matsunami and I<sup>17</sup> have found the old Nonne-Apelt technic least delicate; most satisfactory results



were observed with the methods of Kaplin, Gordon, Noguchi and Pandey respectively. The protein content of the cerebrospinal fluid appears to reach a maximum during or about the third week of the disease and an increase may not be detectable during the early stages; accordingly we have found the total cell count alone of most value in aiding an early diagnosis of epidemic poliomyelitis as the protein tests may or may not be positive and usually are not. In tuberculosis and meningococcus meningitis, on the other hand, the protein tests are usually positive in the early stages, due to the greater degrees of involvement of the meninges.

We have studied the cerebrospinal fluid for other products due to extravasation from the congested vessels and increased permeability of the choroid plexus and meninges. With Lange's colloidal gold reaction Dr. Matsunami and I<sup>17</sup> found that 40 to 50 per cent of cerebrospinal fluids drawn from cases of epidemic poliomyelitis ranging from the second to the nineteenth days after the onset of paralysis tended to react in a rather constant manner, yielding reactions of the "luetie and meningitic zone" types, but similar reactions were found with the fluids from other types of meningitis and we regard the colloidal gold reaction of but helpful diagnostic value, as a peculiar or definite curve of decolorization with the spinal fluid of acute poliomyelitis alone does not occur. Felton and Maxcy<sup>18</sup> have secured similar results and regard the gold chlorid reaction as helpful in the diagnosis of this disease.

As is well known protein will reduce potassium permanganate and Mayerhofer<sup>18</sup> has proposed the reduction of a decinormal solution by 1 c.c. of cerebrospinal fluid in an acid medium as an index of the amount of protein present. While 1 c.c. of normal spinal fluid usually reduces 2 or 2.3 c.c. of a decinormal solution, the fluid in meningitis and particularly tuberculosis meningitis may reduce 3 c.c. or more due to the larger amount of protein present. Dr. Matsunami has applied this test to 78 fluids from persons in different stages of epidemic meningitis ranging from the second to the twenty-first days; in 41 per cent of the reduction index was found higher than normal, but as this result is closely parallel with the simpler protein tests, the Mayerhofer reduction test cannot be said to possess definite value in the diagnosis of poliomyelitis.



As a test for the increased permeability of the meninges and choroid plexus Dr. Meine and I<sup>17</sup> have applied the Weil-Kafka hemolysin reaction in a study of cerebrospinal fluids from 65 cases of acute poliomyelitis. Normally the blood of over 90 per cent of persons contains natural antisheep hemolysin or a substance, which, in the presence of complement will hemolyse the red blood corpuscles of the sheep. The normal cerebrospinal fluid is free of this substance. In acute meningitis, however, the hyperemia and increased permeability of the vessels and exudative processes may result in the passage of this hemolysin into the cerebrospinal fluid. Likewise, hemolytic complement, which is a constituent of normal blood, is not found in appreciable amounts in normal cerebrospinal fluid, whereas in acute meningitis this substance has been found. In our study of the cerebrospinal fluid in acute poliomyelitis 66 per cent showed the presence of the hemolysin alone and 30 per cent of both hemolysin and complement, whereas all control fluids were negative. These results indicate that in acute epidemic poliomyelitis these substances may be found in the cerebrospinal fluid, but here again the findings are of a group nature, not specific for poliomyelitis, but of aid in the diagnosis.

Likewise, Hauptmann's saponin reaction based upon the observation that in a breaking down of nervous tissue substances are liberated into the cerebrospinal fluid capable of inhibiting the hemolytic activity of a solution of saponin, has yielded Dr. Meine and I uniformly negative results when applied to the study of spinal fluids from 30 cases of acute poliomyelitis.

While the physical appearance of the cerebrospinal fluid in acute poliomyelitis is not characteristic or specific for this infection, yet when considered in relation with other changes it may be of aid in diagnosis. Usually the fluid flows as if under an increased pressure; the majority of the fluids examined by us were water clear or showed but a faint opalescence or ground glass appearance when viewed against a black background. The water like appearance of the fluid resembles that found in serous or aseptic meningitis and tuberculous meningitis; distinctly turbid fluids were found only later in the disease and after the onset of paralysis. Many specimens contained small amounts of blood and if the physician can feel some assurance that the presence of blood is not due to puncture of a vessel alone the hemorrhage is of some significance, because hemorrhages minute or extensive

are frequently found in the spinal cord in acute poliomyelitis due to some effect, either toxic or mechanical, upon the intimal linings of the vessels.

In the early stages of poliomyelitis, before the onset of paralysis, and in an atypical case difficult of clinical diagnosis, three conditions are usually before us for differentiation from acute poliomyelitis, namely, aseptic or serous meningitis or meningismus, tuberculous meningitis and meningitis due to the meningococcus, pneumococcus or other micro-organism.

In serous meningitis the fluid is water clear, the protein tests are usually negative and the total cell count normal or but slightly increased. In tuberculous meningitis the fluid may be clear or slightly opalescent, the cell count is high, the predominating cell is a small lymphocyte and the protein tests are usually strongly positive. In my experience the protein content is usually greater in this infection than found in the early stages of acute poliomyelitis and this finding, together with a patient search for the tubercle bacillus may serve for differentiation. In meningococcus and pneumococcus meningitis the diagnosis is usually made without undue difficulties unless the fluid is collected very early in these infections, on the basis of very high total cell counts, the predominance of polymorphonuclear cells, large amounts of protein, failure to reduce Feblings solution and particularly by the presence of the specific micro-organism which may be found in smears, cultures or both.

Since Flexner and Amoss<sup>19</sup> have reported that simple lumbar puncture attended with even very slight hemorrhage opens the way for the passage of the virus from the blood into the central nervous tissues and thus promoting infection, it would appear that physicians should not resort to spinal puncture for diagnosis without due consideration and study, and a special effort should be made to secure sufficient immune serum for an intraspinal injection if poliomyelitis is suspected, as Flexner and Amoss have found in their experiments that immune serum alone is capable of neutralizing the virus in the nervous tissues when the virus is introduced into the blood of monkeys.

As a definite and specific diagnostic laboratory test for acute poliomyelitis is lacking, it would appear necessary for the physician to have clear and definite knowledge of the symptoms of the disease and particularly the early manifestations; under these conditions an examination of the cerebrospinal fluid may be of

distinct aid in diagnosis. A clear or slightly opalescent fluid flowing under increased pressure, poor in fibrin, reducing Febeling's solution and containing an increased number of cells chiefly of the lymphocyte variety, are the most constant findings. An increase of protein and a high potassium permanganate reduction index strengthen the diagnosis, while a gold chloride reaction of the meningitic zone type and the presence of natural antishoop hemolysin are helpful diagnostic data. Since on examination of the cerebrospinal fluid for diagnostic purposes is called for only in the early stages or in atypical cases when the changes are likely to be slight, our technique should be accurate and delicate. This is particularly true of the total cell count and it is advisable to make this examination as soon as possible after collection of the fluid; the ideal method is to make the total cell count and a protein test at the bedside, both of which may be done by the specially trained physician with little trouble.

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## AMERICAN PEDIATRIC SOCIETY

Twenty-Ninth Annual Meeting, Held at White Sulphur Springs, W. Va., May 28, 29 and 30, 1917

THE PRESIDENT, DR. FRANK SPOONER CHURCHILL, OF CHICAGO,  
IN THE CHAIR

### THE RESPONSIBILITY OF THE AMERICAN PEDIATRIC SOCIETY IN THE PRESENT NATIONAL CRISIS

DR. FRANK SPOONER CHURCHILL, of Chicago, said that in this critical period of our national history we were all asking ourselves what was our duty and what we could do to help our country. We asked these questions not only as individuals but as organizations. It was therefore fitting on this occasion that he should point out some of the directions which their efforts might take in order that, if possible, they might evolve definite ways and means of contributing their share towards the solution of the many problems in which our country found itself involved. The advice to the individual had been, "Do for your country that which you are best fitted to do." Similarly with a society it might be said that they should do that which the nature of their organization made it possible for them to do efficiently. They should as far as possible make the same mental and physical efforts they had always made but should now turn these efforts more than ever to the country's good. Clearly the direction which their contributions and efforts should take was that which would best safeguard the child life of the country, not only from those dangers already existing but, in addition, from those which would inevitably arise as a result of the war. They might meet those problems in a twofold manner—first, by continuing agencies already devoted to the interests of children, and, second, by making renewed and greater efforts to meet new problems. We both as individuals and as an organized group should lend substantial support and influence toward the continuation of active organizations devoted to the welfare of infants and children, since there was apparently danger that the beneficent activities of these organizations might be curtailed by cutting the appro-



priations to public ones and by failure of subscriptions to the private ones. This would be suicidal and destructive. War always left in its wake pain and suffering, devastation and destruction, and one of its most cruel results was the effect upon the young and helpless. We must exert ourselves to minimize this injury to our young. Such efforts were demanded by both humanitarian and economic reasons. The physical problems to be met had to do largely with nutrition and bodily sickness. There would be two groups of children requiring attention—the children of the poor and the children of enlisted men. The latter group must be the object of our special solicitude. It is within the power of this and other groups of pediatricians, by organized effort, to render great service to the children of these fighting men, not as a gift but as a just payment from us. Great care must be exercised that the nutrition of children did not suffer as the result of enforced economy by large numbers of the population. Our organization could well and profitably concern itself with an intensive study of food stuffs for the young, draw up diet lists embodying the result of such study, naming articles of food of proper nutritional quality, giving the caloric value and wherever possible suggesting cheaper substitutes for the present high-priced articles. The widespread publication of such diet lists in both lay and medical press, emanating from the American Pediatric Society would carry weight and authority and would undoubtedly be of service to large numbers of people.

Equally important with the problem of nutrition of the child were problems of a moral nature involved in the questions of child labor and delinquency. We had had ample warning of the danger in both directions from the experience of the warring countries. It was estimated that there had been in these countries an increase of 34% in juvenile crime and delinquency. Existing child labor laws should be enforced and juvenile protective associations should be heartily supported. Our part in this war was to "fight in terms of the next generation." The quality of that generation would be the measure of our victory in the war. The members of the American Pediatric Society were also active in the American Medical Association, in state and municipal pediatric societies and in various civic lay organizations. We thus had at hand the machinery for executing on a broad and comprehensive scale plans for the protection and preservation of the child life of the nation.

## PRIMARY CARCINOMA OF THE LIVER IN CHILDHOOD

DR. J. P. CROZER GRIFFITH, of Philadelphia, said that carcinomatous neoplasms were uncommon in infancy and childhood as compared with adult life. Carcinoma appeared to be more rare than sarcoma. The case herein described occurred in a female child, 21 months of age, whose family history was negative. The child had previously been in good health, except for some degree of anemia, supposed to be dependent upon indigestion and a constant tendency to constipation. Five weeks before the child's father had accidentally discovered a lump on her right side beneath the costal margin in front. Midway between the midsternal and the right mammillary line there was a decidedly visible prominence which, on palpation, was found to be a hard, smooth mass, apparently connected with the liver. It changed its position distinctly with respiration. A provisional diagnosis of tumor or cyst of the liver was made. At operation situated in the right lobe of the liver was a dark gray, glistening, fibrous capsule, covering a tumor mass the size of an orange which projected slightly above the organ and extended in depth through the entire thickness of the lobe. As the case appeared to be inoperable the wound was closed. Histological examination of a small portion of the removed tumor stated that the nodule consisted entirely of epithelial cells without trace of liver tissue. The subsequent history of the case was that the growth continued to increase in size, sometimes rapidly and at other times more slowly until death occurred, about 9 months after the writer first saw the child. Dr. Allen J. Smith, who examined specimen, agreed as to its nature and believed that the growth was originally a cancer of the bile ducts.

The writer reviewed 57 cases, 44 of which were collected by Steffen and Castle and had added 13 cases. Of this series 25 were males and 26 females. In others the sex was not mentioned. In this series of cases there were 8 occurring in the first 3 months of life and 16 during the first year of life. The occurrence of so many cases suggests the existence of a tumor of embryonal nature. Of these cases some were simple carcinoma, some clearly adenocarcinoma, and others included provisionally were described as adenoma. The symptoms were entirely uncharacteristic and depended to some extent on the mechanical effect of the growths. The emaciation and cachexia natural to

carcinomatous neoplasms were present. Icterus and ascites have been noted in some instances, but more frequently they were absent, or no statement was made regarding them. Operative interference was attempted in only one instance and that without success. It could only be done in the case of a single encapsulated tumor.

#### INTRAVENOUS INJECTIONS IN INFANCY

DR. CHARLES HUNTER DUNN, of Boston, said the principal difficulty attending intravenous injections and transfusion in young infants had always been a technical one due to the extremely small size of the veins. The longitudinal sinus in the infant was a large vein very easily accessible through the open fontanel. If the employment of this route in performing transfusion avoided the principal technical difficulty, it was available not only for transfusion in hemorrhagic disease of the newborn as suggested by Helmholtz, but was also available for the giving of intravenous injections and medication. At the Infants' Hospital they had adopted the use of the longitudinal sinus for the purpose of obtaining blood for the Wassermann reaction, and of giving intravenous injections. The technic had proved to be extremely simple and apparently free from danger, except perhaps when salvarsan was used. They had used the longitudinal sinus for the giving of normal salt solution, sodium bicarbonate in acidosis, antitoxin in diphtheria, circulatory stimulant drugs, and solutions of dextrose. It was the latter which he wished especially to consider at the present time. The cases in which the intravenous injection of dextrose was used were approximately all of the same type. They were cases of extreme atrophy and inanition produced by various forms of gastrointestinal disease. All the cases reported in the present series were infants who were either admitted to the hospital in an actually moribund condition, or, who, after admission, became steadily worse under all ordinary methods of treatment.

The theoretical basis for the use of intravenous dextrose injections in such cases was that apparently the vicious circle produced by gastro-intestinal disorders had become so extreme that the digestion and absorption of sufficient fluid to furnish energy requirement of the body was impossible. Dextrose was the only food substance which existed outside of the body in the same form in which it circulated in the blood and was utilized

by the tissues. Consequently it seemed that introduced directly into the blood it might through a temporary supply of even a small quantity of fuel, break the vicious circle for a sufficient length of time to permit improvement of the condition to take place.

The technic used was very simple. A syringe sufficiently large to hold the entire quantity of fluid to be given was connected with the needle by means of a flexible rubber tubing. There was a glass window in the tube just above the needle. The needle used was of the same size as that used for lumbar puncture in infants. After sterilizing the apparatus the syringe was filled with a sterile 5% solution of dextrose. After expulsion of the air in the tube the needle was entered at the posterior angle of the fontanel. Three persons were required to give the injection—one to study the head of the child, one to manage the syringe and one to manipulate the needle. After entering the sinus the piston of the syringe was slightly and slowly withdrawn until blood appeared in the glass window. This showed that the needle was actually in the sinus. The movement was then reversed and the dextrose inserted very slowly. By this method one was sure the dextrose was going into the sinus.

In determining the quantity of dextrose the writer rather arbitrarily adopted a 5% solution. They began with a quantity of fluid which it was safe to inject, and as it produced no bad results they adopted this amount as a standard for the intravenous injections. In choosing the quantity of dextrose for intravenous administration to an individual baby, one-sixtieth of the body weight was taken. In 18 cases the records were sufficiently complete for the purposes of this report. In some of the cases the improvement which followed the injections was so immediate and so striking that it seemed to the author that there was a possibility at least that the injections produced a good effect. All the cases it must be remembered were of a type in which a fatal ending seemed imminent. Of the 18 cases 13 died and 5 recovered. After the injections 7 cases showed no improvement, 5 showed a slight temporary improvement, and 6 showed a very striking improvement immediately after the injections. There was, however, no evidence that the improvement, even if it was due to the intravenous, injection was due to the dextrose. The giving of fluid into the circulation in cases of this character was a therapeutic procedure of known value and it was quite possible



that the apparent improvement was due to the fluid and not to the dextrose. There was, however, in the writer's opinion, sufficient possibility of the dextrose being of value to warrant its further trial. Careful urinary examinations in these cases showed that whether or not the dextrose produced a favorable result, it was at least utilized by the child's metabolism. In 5 cases more than 1 injection was given and in 1 case 6 daily injections of 3 grams each of dextrose were given and in this instance the patient was practically kept alive by the dextrose and eventually recovered.

DR. HENRY F. HELMHOLZ, of Evanston, Ill., said that Dr. Woodyatt had devised a pump by which they could introduce the sugar solution at a uniform rate and by which they were able to vary the rate at will. They had given 0.8 grams of sugar per body weight to a number of children and there had been no sugar excreted in the urine. He thought that in this connection there was no danger of overloading the circulation and putting too great a strain on the heart.

DR. GODFREY PISEK, of New York, said that they were using a syringe in this work by means of which they were able to withdraw the fluid in the usual way and then make the injection by the gravity method. This provided an additional element of safety.

DR. ALFRED F. HESS, of New York, cited a case of hemorrhagic disease in an infant that was treated by aspiration. The child died and it was found that there had been a hemorrhage and the blood had gone down between the brain and the skull. He now felt some hesitancy in entering the sinus in hemorrhagic cases.

DR. HELMHOLZ said that Dr. Hess's experience recalled 3 cases, not his own, that were transfused through the jugular vein, and although the injection was very carefully given the base of the brain as well as the cortex was covered with blood; he thought this was due to some pathological condition, and not to the injection.

DR. DUNN, in closing, said he thought it would be perfectly safe to give a stronger solution, but in the beginning of the work they thought it advisable to proceed very cautiously. It was possible that salvarsan could not be safely administered in

this way though they had given it a number of times when everything seemed to go perfectly well. Later they had 2 deaths after the administration of salvarsan and they then stopped giving it, though nothing was found at autopsy in these cases that could be attributed to the injection. The feature of this work that was of interest was the various theories in reference to the etiology. The opinion had been expressed that these conditions were due to defective carbohydrate metabolism and to its effect on the liver.

#### THE THERAPEUTIC USE OF BLOOD SERUM

DR. ROWLAND G. FREEMAN, of New York, said that in a case of hemorrhage in a new-born infant to which he was called hurriedly, and found the child in a critical condition, he had given an injection of 15 cubic centimeters of blood serum (from the father's blood); the bleeding was controlled and the child went on to normal development. This had so impressed him, even though there was nothing unusual in the reaction of the blood serum in this case, that it brought up the question whether this treatment might not be applied to other conditions with good results. Of these conditions one which they always had with them was marasmus. Dr. Freeman said he happened to have at this time in his service at Roosevelt Hospital a baby, 7 months old, who came in weighing  $12\frac{1}{2}$  pounds, and who though fed on different promising foods, excepting breast milk, continued to lose. One month after admission he had lost a pound and he thought one day in making his rounds that because of the appearance of the child and his grayish color that he was dead. He was still alive. He gave him hypodermoclysis 250 cubic centimeters. This was followed by a rise of temperature and an increase of several ounces in weight. On the following day 20 cubic centimeters of horse serum were injected. This was followed by a temperature reaction up to  $102^{\circ}\text{F.}$ , as occurred on 2 following days, when he again received injections. Seventeen days after this treatment was commenced the child had gained  $1\frac{3}{4}$  pounds and the treatment was given only every second day, but a larger amount of horse serum was given. A little less than a month after treatment was commenced the child's condition was so satisfactory that injections were discontinued and his improvement continued. This baby, he thought certainly would have died without this treatment.

Recently he had had on his service at Roosevelt Hospital 4 children at the same time with a weight of 5 or 6 pounds; all were about 2 months old, and all had been labored on with different sorts of feedings continuously since their admission. On the same day treatment was started on all 4 babies. The histories of these cases seemed to show that when the injections were stopped the improvement was not so rapid and indeed there would be a loss in weight, but as soon as the injections of horse serum were resumed the children again gained in weight. After giving 2 injections of horse serum it was advisable to test the child for sensitization before giving a third injection. In the second baby in this series the test with a drop or two of horse serum was followed by development of a urticarial rash and this child was considered sensitized and no further horse serum given. In 1 case of miliary tuberculosis with consolidation and cavity, which lost from 26 to 18½ pounds, and under fresh air and heliotherapy gradually gained to 26 pounds, at which she remained stationary for weeks, 20 cubic centimeters of horse serum repeated once apparently started her gaining again. The writer said he had not attempted to describe all the cases in which this treatment was used, nor did he hold that it was in any way a panacea. It was, however, under proper control, a safe procedure and in some almost hopeless cases apparently produced marked improvement. It seemed to the writer that it had a much greater sphere of usefulness than had previously been appreciated. It had seemed of no use to give doses of less than 20 cubic centimeters of the serum.

DR. FRITZ B. TALBOT, of Boston, said it would be interesting to know what Dr. Freeman had done for the future of these children, particularly the one that developed a reaction after 1 or 2 injections of the horse serum. It would be interesting to know to what degree they would be sensitized in the future. Dr. Talbot said he had had quite a number of babies that in similar conditions had shown the same improvement as was shown on these charts without any treatment of this kind. However, one got very different impressions when he observed the patients from those conveyed by a chart.

DR. L. EMMETT HOLT, of New York, asked Dr. Freeman what proportion of the cases he had treated in this way were represented in this report, and if it represented only the ones

that were satisfactory. He said he quite agreed that we sometimes saw similar results in cases not treated in this way. One of the cases, however, showed very striking results.

DR. FREEMAN, in closing, said that horse serum was not only more easily available than human serum, but one could get it in any quantity. In the case reported in which he gave so many injections, treatment would have had to be discontinued had he been dependent upon human serum. He did not think it made any difference whether we used the human serum, the horse serum, or whole blood. As to the possibility of sensitizing these babies to horse serum, it should be remembered that these babies were practically dying babies and the possibility of sensitization was of minor importance at that time. Dr. Freeman said he was not sure himself that the treatment was worth a great deal, but it seemed good enough to make it worth while bringing it before the Society in order to get the opinion of the members.

TWENTY-FOUR-HOUR METABOLISM OF TWO NORMAL INFANTS,  
WITH SPECIAL REFERENCE TO THE TOTAL ENERGY  
REQUIREMENTS OF THE INFANTS

DR. FRITZ B. TALBOT, of Boston, said that the purpose of the present investigation was to determine if possible how much energy was expended in the ordinary muscular activity of an infant during a 24-hour day. If the increase in metabolism due to muscular activity could be determined, if the factor of growth, and the factor of energy lost in the excretions, could be established, this material could be used in conjunction with the average curve of the basal metabolism to estimate the number of calories necessary in a 24-hour day. One of these infants was in the respiratory chamber 22 hours and 31 minutes, and the other 23 hours and 10 minutes. The length of the observation compared very favorably with those of Rubner and Heubner, which were in all instances shorter. Accurate records were kept of the time during which the infants were nursed, the time they cooed, kicked, played, smiled, were changed, and cried. In the observations on the first baby it was found that the "basal" metabolism of 285 calories was increased 143 calories by muscular activity. This corresponded with an increase of 67%. The basal metabolism of the second baby was increased by



muscular activity to an extent corresponding to 70%. Since the infants were removed from the chamber at regular intervals during the 24 hours for their usual nursings, their metabolism could not be measured during that time, but an estimate of what it would have been was considered justifiable. This estimate was made by taking the average maximum total metabolism, which in the second baby was 481 calories and dividing it by 24 hours, which would give 20 calories, the amount produced in 1 hour. The baby was out of the chamber 50 minutes, so that 50/60 of 20 or 17 calories would be theoretically the amount excreted during the 50 minutes this baby was out of the chamber. This was added to the measured metabolism and went to the total calories produced in 24 hours. There were, however, other ways in which energy might be lost from the body such as the potential energy of the urine and feces. This energy which was lost must be supplied in the food. Presumably the greatest single factor to take into consideration was the fat lost in the feces, which with the urea in the urine should not exceed 15% of the total measured metabolism in a normal infant. A rough estimate of the caloric requirements of the normal infant might be made by adding the calories used up in muscular activity to the basal metabolism. If the infant was very quiet 15% should be added; if normally active 25%, and if extremely active 40%, more or less. To the result 15% should be added for energy lost in the excreta and 20% for growth. In the case of the first baby we knew how many calories were actually used up in muscular exercise. Therefore, all that was necessary was to add the probable amount of calories necessary to allow for growth and what was lost in the excreta. If 35% was added to the 74 calories per kilogram of body weight actually used by this baby it is found that he needs about 100 calories per kilogram in his food. If the same process was followed out with the second baby the food requirement was found to be 94 calories per kilogram body weight. The writer made the practical suggestion from these observations that it was probable that infants fed on cow's milk and particularly on formulas containing large amounts of protein, would require even more food than infants fed on human milk, because the stimulating action of the protein caused extra heat to be burned during digestion. The caloric requirements of normal infants obviously were not the same as for sick infants whose basal metabolism was higher per kilogram of body weight;

neither did it apply to the infant with a subnormal temperature indicating depressed vital functions. These infants came under another category and required further study to answer many of the points now obscure.

DR. THOMAS S. SOUTHWORTH asked whether the babies were kept at the same temperature throughout the experiment and whether any calculations had been made to find out how much energy was used up because of the changes in temperature to which babies were exposed, as when the lower extremities were exposed. He said that he had just told the parents of a baby that was being dressed without shoes and stockings that he thought the baby would do better if its feet and legs were covered, as it was probably losing energy through a loss of heat that should go into growth. A certain English writer had made investigations along this line and had estimated that a certain additional number of ounces must be given to provide for the loss of heat when certain portions of the body were exposed.

DR. PISEK said he thought the estimate was low for the amount of energy the child used when out of the chamber, particularly the amount of energy used in nursing. The amount of work the child did when out of the box was greater proportionately than when he was in the box. Dr. Pisek said he wished Dr. Talbot would make some remarks on this point.

DR. TALBOT said that as he had not read all of his paper there were some points that he had not brought out clearly. He had not spoken with reference to the increment for muscular activity because this part of the work had already been published. He thanked Dr. Hoobler for what he had said and stated that there were 9 persons engaged in this piece of work and that it had involved an immense amount of detail work. Perhaps he had not brought out clearly that they did not take the basal metabolism because the baby was not quiet all day. They had written down just what the baby did and when he did it and then took the average of all the active periods and added the amount of heat used up by these activities.

DR. SOUTHWORTH had spoken of the loss of heat from exposure. The surrounding temperature made no difference in the amount of heat the baby produced unless there was chilling, and then he shivered and produced heat. If he did not perform additional exercise he did not produce more heat.

The new-born babe was sometimes given a water bath at the time of birth. That was all wrong. It might result in a subnormal temperature and then there would be a lowered metabolic activity, and all the vital functions would be depressed.

The question as to the individual variation was brought up. In older children Dr. Talbot said they had performed a large series of experiments covering the first 2 years of life, perhaps 10 or more babies. There was no normal for them. It had been found that new-born babies, however, came very near to the average they had figured out.

There was one more point in regard to muscular activity that was brought out by Dr. Lusk, who made some observation on the boys of St. Paul's School. These boys were very active, and it was found that they were actually eating one and one-half times as much as laboring men.

STUDIES ON BLOOD CALCIUM. THE CALCIUM PARTITION OF  
DISTRIBUTION IN OX'S BLOOD AND IN MAN'S BLOOD

DR. DAVID MURRAY COWIE, of Ann Arbor, Mich., said that because of a difference of opinion as to the distribution of calcium in the blood they planned and carried out the present investigation. The practical side of the question had to do with whether it is more expedient and more accurate to use serum or whole blood for the estimation of blood calcium. The argument naturally was in favor of methods which employed whole blood, but hitherto some considerable difficulty had been experienced in washing, reducing, or extracting calcium from whole blood. This they believed had been overcome by the method employed by one of them last year (Laws and Cowie), and still better by a method recently perfected by Lyman. The scope of their work has been to determine the calcium content of whole blood, of normal serum, of serum from defibrinated blood, the calcium content of the unwashed corpuscles obtained from defibrinated blood, of unwashed corpuscles obtained from citrated blood, of washed corpuscles obtained from defibrinated blood, of washed corpuscles obtained from citrated blood, the power of blood corpuscles to combine with calcium, and the character of the combination of calcium with blood corpuscles.

The present communication consists of a preliminary report on the calcium partition and distribution in ox's blood and in man's blood. Their figures were given in milligrams calcium per 100

cubic centimeters. Their studies had not been completed for the washed and unwashed corpuscles from citrated blood and their final figures would be subject to slight changes. In making their calculations they had to consider the relative proportion of serum and formed elements in a given sample of blood. For instance, in ox's blood 32.55% of the whole blood was composed of formed elements (corpuscles), 67.45% of serum. In man's blood 51.302% was composed of formed elements, 48.698% serum. By calculation on this basis we find that the calcium content of whole blood is definitely greater than that of an appropotional amount of serum. So much so that one must admit that the corpuscles are not negligible. The calculated amounts of calcium in the serum and corpuscles respectively of 100 cubic centimeters of ox's blood and of man's blood showed that the serum of ox's blood contained more calcium than the serum of man's blood; that the corpuscles and fibrin of man's blood contained more calcium than the corpuscles and fibrin of ox's blood, and that the whole blood of man contained more calcium than the whole ox's blood. The possibility of a variation in the relative proportion of corpuscles and serum under altered states of the organism must also be taken into consideration. There was more serum per volume of blood in severe anemia and in cases of hydremia. A study of the comparative calcium content of corpuscles and serum in altered blood states might be of considerable interest. The Lyman method was well adapted for either corpuscles or serum. With proper equipment and reliable chemicals the method was of clinical utility.

#### THE URIC ACID CONTENTS OF THE BLOOD IN NEW-BORNS

DR. J. P. SEDGWICK and DR. F. B. KINGSBURY, of Minneapolis, said it had long been known that the uric acid excretion in the urine of children during the first few days of life was both relatively and absolutely high. It was also well known that during this period, when the uric acid excretion was highest, rapid morphological changes occurred in the blood of the new-borns, the disappearance of the nuclei of many of the red cells, the change in proportion from a predominating number of polymorphonuclear neutrophils to a corresponding preponderance of lymphocytes, and the striking decrease in the leukocyte count of the peripheral blood. The polymorphonucleosis dropped rapidly from the second to the fifth day. Nucleoproteins set free



by the leukocyte destruction had been considered the source of the well-known high uric acid excretion of the first week. The purpose of the present investigation was to determine whether or not the high uric acid excretion during the first few days of life was accompanied by a simultaneous increase of this substance in the blood. Benedict's modification of the original Folin-Denis method for the determination of uric acid was tried, but found more tedious than the later modification of Myer's, Fine and Lough. The latter modification with certain minor changes was used throughout the work. The weights of blood samples used in these analyses varied from 9 to 18 grams and were drawn from the superior longitudinal sinus of the new-borns through a sterile hypodermic needle into a glass syringe and expelled into small weighing bottles containing 0.1 gram of potassium oxalate. The placental blood was collected as soon as possible after cutting the cord, which was done late, that was, after the cord had stopped pulsating. The maternal blood was drawn from the arm of the mother at the time of parturition. All the new-born subjects that served in this investigation were normal. They found the average values for 16 determinations of the uric acid content of maternal and placental blood identical, being about 3 milligrams per 100 milligrams blood, agreeing in this respect with the independent findings of Slemons. In some cases the infants were given water in addition to their ordinary diet of breast milk. It might be observed that the content of uric acid in the blood the first 3 or 4 days after birth was higher than that of the blood of the same new-born at birth. In 7 cases there was a marked decrease in this value at the end of 8 to 11 days from the value obtained 3 to 8 days earlier (in the same infant in each instance). It was noted that in the period between the second and third days, 48 to 71 hours, that the value reached a maximum. During the first 3 or 4 days this value was higher than the maternal and placental figures. From a maximum of 3.9 milligrams the blood uric acid fell off slowly to 2.9 milligrams on the fifth day and then rapidly to 1.6 milligrams by the eighth to the eleventh day. This value agreed with the 1.3 to 1.8 milligrams found by Liefmann in the blood of thriving children from 9 weeks to 14 months of age, on a pure milk diet. Our findings supported those of Wells, Vorper and others (in opposition to the results of Schittenhelm and Schmidt) that human fetal tissues

possess no uricolytic power, for it would be difficult to imagine so great a production of uric acid if the tissues themselves possessed the power to destroy it. Whether the decomposition of nuclein material which must be looked upon as the cause of this uric acid increase in the blood was related to the striking changes in the blood cells, particularly in the partition of white corpuscles taking place at this time or to nuclein destruction in other parts of the body as yet unknown, or to both, must be left to the future to decide. These results fitted in well, however, as the connecting link in the theoretical chain of early leukocytosis, fall in leukocytosis, flood of uric acid in the blood, high uric acid excretion, uric acid infarcts.

DR. TALBOT said this was one of the very obscure periods of life. Dr. Sedgwick had given them material which should open up the way to further investigation in the new-born. In spite of the voluminous book which Royce had given them they knew very little about the new-born.

DR. PERCIVAL J. EATON, of Pittsburg, said that he understood that some of these babies were receiving water and others were not. It would be interesting to know whether Dr. Talbot found a greater concentration of uric acid in the urine in the children who did not get water than in those who did.

DR. SEDGWICK said he had made no examination of the uric acid excreted in the urine in this series of babies, but only of the uric acid in the blood.

#### THE SALTS IN GREEN VEGETABLES AND THE EFFECT OF DIFFERENT MODES OF COOKING

DR. FREDERICK H. BARTLETT, of New York, stated that the addition of green vegetables to the dietary of young infants was becoming a common practice. It was believed that their value was due to the effect on the mineral metabolism. The secondary anemia of infants fed too long a time on an exclusively milk diet was easily explained by the small amount of iron in cow's milk. Instead of making use of drugs to supply the needed iron, green vegetables had been fed to many children in the wards and the out-patient department of the Babies' Hospital. The plan had been followed with children as young as 6 or 7 months. Infants thus fed had shown an earlier closure of the fontanel and generally greater activity than those fed without such additions to

their diet. This beneficial effect had been variously explained as due to the mere addition of an increased quantity of salts, to the particular combinations of the bases with the inorganic and organic acids present which provided the salts in an especially suitable form for use by the organism, and, that the value of the vegetables lay in a biological or so-called vitamine effect. The general opinion was that the mineral content was the important factor, and they had studied the subject from this viewpoint. They had studied the actual mineral content of the vegetables as ordinarily prepared and administered. It was obvious that the water used in cooking extracted more or less of the constituents and it was not a common practice to give this with the vegetables.

They undertook an analysis of cooked vegetables, considering separately the solid portion ordinarily given as food and the water used in cooking. They estimated the content in grams of solids of vegetables prepared by boiling, taking spinach, New Zealand spinach, young carrots, onions, string beans, asparagus and potatoes, and estimating the solids, ash, calcium magnesium, phosphorus, potassium, sodium, sulphuric acid, iron, and also total nitrogen and nitrogen as protein. They estimated the percentage lost in water under ordinary boiling conditions; compared the percentages lost in the water with long and short boiling, and compared the percentages lost in water by steaming and by boiling; and also the content in grams of vegetables prepared by steaming of the various constituents, and the approximate content of one tablespoonful of steamed vegetable of the various constituents. Spinach showed the highest total salts, containing from 2 to 3 times as much ash as any of the other vegetables studied. The preponderance was largely due to calcium and phosphorus. The iron was highest in New Zealand spinach; ordinary spinach and carrots being next. The iron in onions was very low, while asparagus had only a trace. The table plainly showed that spinach was the most efficacious in supplying mineral salts. New Zealand spinach did not belong to the family of ordinary spinach. It possessed the advantage of being available for a continuous supply throughout the summer, while ordinary spinach was not so easily obtained. The analyses showed an excessive waste of salts if the water in which the vegetable was boiled was discarded. It ranged from over a quarter of the total ash of onions to nearly three-quarters of that



of New Zealand spinach. In the others the loss was about one-half the total. Calcium was the only constituent which was not affected. The examination of potatoes showed so small a loss of total solids that the analyses were not carried through. The saving of salts by shorter boiling was insignificant. The only exceptions to this were the calcium and chloride in the beans and the sulphate in spinach. Steaming was then tried, a rice steamer being used. The vegetables were held in a tightly covered receptacle with a rather finely perforated bottom. Any type of steamer which held the vegetables out of water would undoubtedly serve as well. Steaming was found to be the most economical method of cooking for preserving the salts. The remarkable saving of salts by this method should be emphasized. In spinach the loss by steaming was about one-half what it was by boiling. The effect of steaming on New Zealand spinach was more variable than in the case of other vegetables. Sodium was lost in a high degree even in steaming. There was a slightly greater loss of calcium by steaming than by boiling, but since the calcium loss was slight in any case this was of little importance. One hundred grams of the edible portion of uncooked vegetable when cooked yielded approximately 3 tablespoonfuls of all but carrots which yielded about 4. If a steamer was not available the steaming might be done in a double boiler, placing no additional water in the inner boiler. There was very little difference between this method and steaming, the difference being in favor of steaming.

DR. GODFREY R. PISEK asked Dr. Bartlett how he got infants to eat vegetables, as frequently they did not like vegetables, and whether he fed the vegetables through the bottle.

DR. SEDGWICK said that this was a subject in which they had been interested. One of their workers in the Department of Economics had made investigation showing the importance of retaining the salts in vegetables. The infant metabolism experiments of F. B. Roder showed the retention of calcium in the feeding of a vegetable-free diet and when vegetables were given to children. They had been interested in trying to find out the amount of calcium necessary to produce calcium retention and found that the quantity was enormous, and that the small amounts of calcium given therapeutically were simply a farce. They gave 5 grams in 24 hours during the first year and found



that if they used 3 grams they did not get as good results. It took twice as much calcium lactate as it did calcium chloride to get the same results. The results obtained by the McCrudden method, by which the amount of salts in the whole diet was taken instead of that in individual parts, confirmed the results obtained by Dr. Bartlett.

DR. HOLT emphasized the importance of paying attention to the minute division of vegetables fed to infants as they were in the nature of a foreign substance in the intestinal tract of the infant. The vegetables should be rubbed through a fine sieve and if this were done it was surprising how little effect they had on the infant's stools, even if the stools were prone to be loose. One mistake was that of allowing a baby to have the bottle until  $2\frac{1}{2}$  or 3 years of age. This habit was responsible for a severe type of malnutrition in some instances.

DR. TALBOT asked Dr. Bartlett if he had made any analysis of Swiss chard, which was a vegetable used to a considerable extent in Boston.

DR. PERCIVAL EATON called attention to the fact that the water in which vegetables were cooked made a good soup stock. It should be kept and used in split pea or bean soup and in this way the mineral salts could be conserved.

DR. ROLAND G. FREEMAN said it had been his experience that children with poor digestive capacity did not take vegetables well and that the vegetables were found undigested in the stools. He had used stewed lettuce and would like to know whether Dr. Bartlett had made any investigations with lettuce.

DR. HEIMAN said he had had much the same experience as Dr. Freeman, but one must not lose sight of the fact that we had unsplit carbohydrates as well as unsplit proteins. The experience they had had in New York in feeding babies made them realize the necessity of giving vegetables as early as possible, not alone because they contained iron, but for their other contents which were required for the growth of bone and other tissues.

DR. COWIE said they had had some trouble in attempting to use as much spinach as they did carrot. They found that this could not be done.

DR. HELMHOLZ called attention to an article which had been published which described the method of drying and pulverizing

vegetables. The powder thus prepared could be made into the finest emulsion and with this babies 2 or 3 months old could be fed without any effect whatsoever on the bowels.

DR. BARTLETT said that if the vegetables were rubbed through a fine sieve they could be fed either with a spoon or in the bottle. It was a mistake to begin feeding vegetables in as large amounts as a tablespoonful. One should begin with a very small quantity and increase it gradually. Dr. Bartlett also said he had not had any such trouble as Dr. Freeman had mentioned. Swiss chard he had not examined but would do so.

#### CONGENITAL SKIN DEFECTS

DR. ISAAC ABT, of Chicago, said the so-called congenital skin defects had not been frequently recorded in the literature. The majority of reports at hand dealt with skin defects of the scalp, which varied in size from a pin point to a small coin. They are usually circular in shape, sometimes oval or irregular, and generally had clean-cut edges. Most writers attributed their cause to either errors in development, or to inflammatory adhesions between the external layers of the skin and the amnion. At the point where this adhesion had taken place, the growth of flat epithelium was retarded. As the liquor amnii accumulated, the so-called Somonart's bands were formed. If these bands were torn loose from the integument of the fetus, a skin defect remained. Not infrequently these skin defects were associated with other congenital malformations such as deficient fingers, hands or feet, caused by the action of the amniotic bands. Though these lesions were found most frequently on the scalp, Emanuel reports a case with congenital skin lesions occurring on hands, legs and feet, over the temples and the bridge of the nose, and also an area in the middle of the lumbar region. These defects seemed to bear no relation to traumatism at birth and undoubtedly originated in utero. Occurring singly or in groups they presented ulcerated areas which affected both layers of the skin. The subcutaneous tissues were not involved. The ulcerated areas were sharply defined, somewhat irregular in outline; the base of the ulcer was red and secreted a thin lymph. In some of the recorded cases the defective skin areas developed hairs later in life. Microscopically the area under examination showed the lack of epithelial structures, smooth muscle and adipose

tissue. The skin glands developed, if at all, in a rudimentary manner. The condition had been referred to as a congenital atrophy of the skin, but this could hardly apply, for the reason that atrophy implied degeneration, and no degenerative process was discernible. The majority of these lesion tended to cicatrize in a short time.

The case which formed the subject of this report was a newly-born infant referred to the writer from the Chicago Lying-in Dispensary. The parents were normal, labor was normal, and the infant was normal at the time of birth, except for two defective skin areas over both knees. These areas were about  $1\frac{1}{4}$  inches in diameter, symmetrical, and seemed to be, so to speak, irregularly punched out. The skin around the edges was drawn and puckered, presenting the appearance of ulcers. The base was beefy red and moist. A few small areas of this red ulcerated surface showed a yellow exudate. A whitish scar seemed to cross the ulcerated area as though connective tissue bands indicated the beginning of a process of cicatrization. The ulcers from week to week became more and more cicatrized, and after 5 or 6 weeks were replaced by shiny white patches, somewhat lighter in color than the surrounding skin, though the healing process was apparently complete so far as the external healing appearances were concerned. A review of the cases reported in the literature was appended, giving the sex, age, localization of the lesion and other data.

#### ENLARGEMENT OF THE THYMUS TREATED BY THE X-RAY

DR. ALFRED FRIEDLANDER, of Cincinnati, said the purpose of this paper was to emphasize the following: 1—Enlarged thymus is much commoner than is ordinarily supposed. 2—The diagnosis can be made definitely by means of simple physical examination and the X-Ray. 3—In the X-Ray we possess a therapeutic agent which in and of itself will effect a cure in the vast majority of cases. While very little was known about the etiology of enlarged thymus, certain facts had come to light in their studies. Quite a number of their cases had occurred in babies suffering from congenital syphilis. At present no conclusions could be drawn from those observations. A distinct familial tendency had also been noted. In their recent cases 4 families had more than 1 child affected. Two pairs of twins came under their observation, all 4 having enlarged thymus.



They had also noted an apparent relationship of hypertrophic stenosis of the pylorus and enlarged thymus. It should be borne in mind that some cases of enlarged thymus ran a symptomless course. These latent cases were discovered only as the result of careful routine examination. Sudden death as the result of trauma, anesthesia or intercurrent affection occurred not infrequently in these cases. In fact, intercurrent affections frequently lighted up the pressure effect of an enlarged thymus hitherto unsuspected.

There are three definite symptoms of enlarged thymus which were present singly or together, namely, dyspnea, continuous or remittent; suffocation attacks with cyanosis, and stridor. Between attacks the dyspnea was continuous. In the intermittent forms, children apparently quite normal were seized with suffocative attacks, accompanied with cyanosis, usually associated with convulsive movements of the extremities, followed after a few moments to return to an apparently normal state. The intervals between the attacks, at first considerable, tended to become shorter. Stridor when present was usually inspiratory.

The diagnostic physical signs of greater importance were detection of a bulging mass in the jugular (more often absent than present) and enlargement of the area of normal thymus dullness on percussion. In young children there was a definite form of thymus dullness in the shape of an irregular triangle or truncated cone whose base was the sternoclavicular junction and whose apex was the second rib. Literally the dullness extended but little beyond the sternum. The percussion of the area of thymic dullness was not difficult if one used very light, or at times threshold percussion. Dr. Sidney Lange, of Cincinnati, had worked out a very careful technic by which definite information as to the existence of thymus enlargement is afforded by the X-Ray. The child must be flat on his back, with no lateral tilting and the exposure must be instantaneous. In the series presented the time of exposure varied from one-sixtieth to one-thirtieth of a second. A very soft X-Ray tube should be used. In their work there had been no difficulty in differentiating enlarged thymus radiograms from those of congenital heart lesions, or caseous lymph nodes.

The treatment of enlarged thymus was in reality remarkably simple. The results of thymectomy might aptly be summarized by one of its advocates, Parker, who said, "Of 50 patients



operated upon, 17 died, a mortality of 33 $\frac{1}{3}$ %. In the X-Ray we had a therapeutic agent at once safe and remarkably efficacious. Their series now exceeded 100 cases with 4 deaths.

The technic as worked out by Lange was as follows: A Coolidge tube backing up a 9 $\frac{1}{2}$  inch spark was employed. The rays were filtered through 4 millimeters of aluminum and a piece of thick leather. The target skin distance was approximately 9 inches. The routine exposure was 25 milliampere minutes. In mild cases a single dose given over the anterior surface of the chest proved sufficient. In more urgent cases 50 milliampere minutes were administered at the first treatment, 25 anteriorly and 25 posteriorly. During the treatment the child was kept quiet by 4 sandbags, 1 placed across each arm and each leg. The interval between treatment was usually 1 week, unless urgent symptoms suggested the advisability of more frequent treatments. In order to get the results it was essential that the treatments be comparatively heavy and that they be repeated at sufficiently short intervals. To guard against sudden deaths before the full destructive effect of the X-Ray upon the thymus had been elicited, all cases with urgent symptoms should be kept under close observation and the X-Ray treatments pushed boldly. In the average case, improvements of symptoms had been noted within 24 to 48 hours after the X-Ray treatments. The plates were shown in pairs before and after treatment; in many a very decided improvement was noted in 2 weeks' time or even less.

DR. WILLIAM PALMER LUCAS, of San Francisco, said he had found practically the same type of picture as Dr. Friedlander had exhibited and yet there were no clinical symptoms and he had followed some such children for several months without observing the appearance of any symptoms. In cases with enlarged thymus and symptoms he had obtained the same results as Dr. Friedlander but not in 2 weeks. His cases had required months of treatment with practically the same dosage as Dr. Friedlander had prescribed.

DR. TALBOT said he had had much the same experience as Dr. Lucas. Many times the X-Ray had failed to tell them whether an enlarged thymus were present or not. They had been getting the same improvement under X-Ray treatment in these cases, but he could not say what the dosage was. They had also found that there would be an improvement in the clinical symp-

toms under treatment before there was a demonstrable improvement in the X-Ray picture. He cited 1 case in which between 4 and 5 years after an apparent cure under X-Ray treatment there was a return of symptoms, requiring a long course of treatment.

DR. COWIE said he had had children sent up from the X-Ray room for further examination with the report that the X-Ray showed enlarged thymus which could not be confirmed by physical examination. He had also seen typical cases of thymus enlargement which were not shown by the X-Ray.

DR. SAMUEL McC. HAMILL asked if anyone had had a case of thymus enlargement X-Rayed several times without any treatment being given. He had seen one instance in which the first X-Ray picture showed an enlarged thymus and 2 weeks later when another picture was taken there was no shadow. He wondered whether the exposure to the X-Ray in taking the picture could have had any therapeutic effect on the thymus.

DR. J. P. CROZER GRIFFITH said he believed there was such a thing as thymic asthma and that deaths occurred from it. He had seen this condition steadily disappear under X-Ray treatment; it was equally true that one might have an enlarged thymus without any symptoms and yet have a child die of it. Thymus enlargement was an accompaniment of status lymphaticus, and the symptoms and results that one saw were due to pressure and not to the thymus gland itself.

DR. ALFRED F. HESS called attention to the possibility of an enlargement of the vessels at the base of the heart being taken for thymus enlargement. This enlargement of the vessels was sometimes seen in scurvy in children and in adults with beriberi. In taking the pictures of babies some of the controls gave pictures just like those of thymic asthma and yet no symptoms of thymic asthma were present. It seemed that these shadows might be found very unexpectedly in apparently normal babies.

DR. J. H. M. KNOX, of Baltimore, said that their X-Ray man was rather skeptical as to whether the ordinary X-Ray, such as was applicable to the diagnosis of tuberculosis and other diseases, would detect thymus enlargement. They doubted whether in any case either by physical examination or the X-Ray one could detect thymus enlargement.

DR. F. S. CHURCHILL asked how long Dr. Friedlander had had his cases under observation. What was the shortest and the longest time these cases were under observation.

DR. FRIEDLANDER said that while some cases of enlarged thymus might give no symptoms, an enlarged thymus might produce pressure symptoms or it might produce the symptoms of hyperthymus. Some of these cases might be exceedingly threatening and some that gave few symptoms might result in death. Therefore when one heard of a case that ran a symptomless course that was no reason for not reducing the size of the thymus. Dr. Friedlander said they had examined a large series of cases and had found that in those in which the thymus was enlarged if marked congestion occurred, as in whooping-cough or bronchitis, it might light up the symptoms for which the thymus was responsible and might cause the death of the child.

The point to be emphasized in taking these pictures was that they must be taken instantaneously and the child must be held flat on his back. The time occupied in taking the picture must not be over a small fraction of a second; ordinary X-Ray pictures would not show an enlarged thymus.

In reply to Dr. Churchill's question—the first case was treated in 1903 and was now hale and hearty. Some of the cases went back to 1903 and some were very recent.

#### FOCAL LESIONS PRODUCED IN THE RABBIT BY COLON BACILLI ISOLATED FROM PYELITIS CASES

DR. HENRY F. HELMHOLZ and MISS CAROL BEELER, of Evanston, Ill., presented this study which stated that the mode of infection in pyelocystitis in the infant and child was still far from settled. They had endeavored, therefore, to determine whether or not pyelocystitis could be produced by the hematogenous route. In the first series of 66 rabbits, 8 different strains of colon bacilli were injected intravenously; of these, 26 showed focal lesions of one kind or another. The organs affected were as follows: Kidneys, 11 times, cecum 7 times, gall-bladder 7 times, appendix 5 times, stomach 4 times; in addition there were single instances of hemorrhagic infraction of the descending colon, ulcerative colitis, hemorrhagic enteritis and duodenal hemorrhage. Of the kidney lesions, 3 were hemorrhages of slight extent. The remaining 8 animals showed the following kidney lesions: 3

cortical abscesses, 3 medullary abscesses, and 2 with unilateral pyelitis. Of the animals injected only 2 showed a typical pyelitis, and in both instances the pyelitis was unilateral. These 2 cases emphasized the fact that unilateral pyelitis did not necessarily point toward the lymphatic mode of infection, but that bacteria might lodge in one kidney and grow and not in the other even when larger doses were given than could be conceived of in human pathology.

A second series consisting of 11 animals were injected with a mixed culture of pneumococci and colon bacilli isolated from a severe case of bronchitis and pyelitis in which on catheterization only a glass catheter full of practically pure pus could be obtained just before death. Of the 11 animals injected, 6 showed focal lesions of the kidney, 3 had a pyelitis, 1 had cortical abscess and 2 had diffuse hemorrhages in the cortex. An analysis of the 3 cases having pyelitis again emphasized the difficulty of a study of pyelitis. The first 2 would have been overlooked if section had not been studied and it was readily conceivable that a section taken in another portion of the kidney would not have shown these changes. As controls to these experiments, 4 different strains of colon bacilli isolated from the intestinal tract of infants suffering from slight intestinal disturbances were injected. Three animals were injected with each strain. Of the 12 injected in only 1 animal were there any local findings. This was a purulent appendicitis. The urinary examination in all the animals was entirely negative. The result of these experiments was a considerable surprise; they had anticipated a much larger number of takes in the kidney than were obtained. The most characteristic lesion of the colon bacilli appeared to be the edematous infiltration of the cecum. It would seem that the rabbit in almost 90% of instances could excrete colon bacilli through the kidney without any harm to the kidney. A comparison of this with the results obtained by injecting a mixture of pneumococci and colon bacilli showed that the kidney was more frequently affected; in 6 out of 11 rabbits, or 60%, the mixture caused definite lesions in the kidney. This increase of focal lesions corresponded closely to the difference in appendiceal localization, described by Rosenow, when a mixture of colon bacilli and streptococci was injected. The question naturally arose whether in human pyelitis there was frequently a double infection. The second organism might be easily overlooked,



because cultures were not made easily when both organisms were present, and if present the colon bacilli would tend to overgrow the other.

In conclusion, it might be stated that it was possible to produce typical pyelitis in the rabbit by the intravenous injection of colon bacilli isolated from human cases. If a mixture of organisms was injected the relative number of kidney infections could be greatly increased.

DR. CHARLES HUNTER DUNN related an instance in which a child had an empyema and aspiration of the chest showed a pure pneumococcus infection. A blood culture was taken which gave a pure culture of colon bacilli. Two days later the child developed a typical pyelocystitis. Dr. Dunn said that formerly he did not favor the hematogenous theory of infection in pyelocystitis, but he was now rather coming to believe in it.

DR. LUCAS said that he had been following Dr. Helmholz's work and one of his house surgeons had repeated these experiments. Their results in 3 rabbits studied were practically the same as those of Dr. Helmholz. From their knowledge at present he felt that they were warranted in saying that there was no definite localization in the kidney, but a general infection in which all the organs might be infected. Next to a kidney infection they were liable to have a cholecystitis.

DR. HEIMAN said that if one accepted the theory that pyelocystitis was a hematogenous infection involving the gall-bladder, and the kidneys and the colon bacilli were the predominating organisms, then one had a problem to solve. It seemed that the pelvis of the kidney was more readily infected through the urethra. Of the cases in which the pelvis of the kidney was involved, 75% occurred in girls in whom infection through the urethra took place more readily than in boys.

DR. HELMHOLZ said he was much interested in Dr. Dunn's case in which the blood culture showed the colon bacilli and which developed pyelocystitis. It had been his experience that if there were other organisms present that might possibly have caused the pyelocystitis one might not find them, but usually found a member of the colon group because the colon bacilli had a tendency to overgrow other bacilli. Because we have a case of kidney infection which was of hematogenous origin, it was not

necessary to assume that all cases of kidney infection must necessarily come through that route. The point he wished to make was that infection did occur through the hematogenous route as well as through the bladder; he saw no reason for thinking that the kidney could not be infected in a number of ways.

#### A CASE OF PRECOCIOUS MENSTRUATION

DR. WILLIAM PALMER LUCAS reported this case under the name of precocious menstruation, though it might also have been reported under the name of linear nevus. This child was 19 months of age when first seen. The family history was entirely negative. The child developed her first tooth and sat up when 6 months of age. She talked when 1 year old and her first menstruation started when she was fifteen months of age. She had a slight bloody flow from the vagina and was more irritable than usual at that time.

Physical examination showed a linear lesion on the left side of the lip, yellowish in color, and verging into brown, resembling a keratitic condition. She had well-developed mammæ, showing a slight watery secretion. Her sugar tolerance was good. She showed a somewhat advanced development of the small bones. Psychologically her intelligence was normal, but her faculty of attention was phenomenal. She did systematically things that would have been difficult for a child of 3 or 4 years.

DR. HOWARD O. CARPENTER said that there were some cases of polypoid sarcoma of the vagina reported in children in which there had been a certain amount of hemorrhage; before making a diagnosis of precocious menstruation the possibility of neoplasm must always be carefully looked into.

#### A CASE OF HEMORRHAGIC DISEASE IN THE NEW-BORN TREATED BY DIRECT TRANSFUSION

DR. J. H. MASON KNOX said that, on March 6, he was called to see an infant, 2 days old, because that morning it had vomited a considerable amount of bloody fluid. The family history was unimportant. The mother was perfectly well, 34 years of age. She had 1 miscarriage shortly after her marriage, 12 years before, and was threatened with miscarriage when about 3 months pregnant with this baby. She had 2 healthy children, 10 and 4½ years of age. The birth was spontaneous. The child weighed 7 pounds 6 ounces. Two meconium stools were

passed on the first day of the baby's life and two on the second. On the third day the baby nursed well in the morning and about 9 A.M. vomited a considerable amount of dark, blood-stained fluid. There was no fever or cough. When seen shortly afterward nothing abnormal could be found. During the examination the child passed from 3 to 5 ounces of tarry-stained material, evidently a hemorrhage from the intestinal tract. It was at once concluded that the case was one of melena and transfusion from the mother was determined upon. About 50 cubic centimeters of the mother's blood was received into 2 ounces of sodium citrate solution. With a syringe about 15 cubic centimeters of this was introduced into the longitudinal sinus, and the remainder was administered intramuscularly into the buttocks. From noon to 3:30 P.M. the child passed several tarry stools, was greatly blanched, the pulse became thready and respiration shallow. With complete rest the condition slightly improved and the following morning the child seemed better. At 7 A.M. 2 drams of the mother's milk were given and repeated at 2-hours intervals. The following day the baby had 1 hemorrhage from the bowels, not accompanied by any change in pulse or rise of temperature. The material was darker than before and probably part of the original hemorrhage. The following day the baby had 2 yellow stools and made an uninterrupted recovery. At that time the child seemed to be perfectly normal.

DR. FRITZ B. TALBOT said one of the interesting features of these cases was that they frequently had a high temperature at some stage of the disease. The question had suggested itself to him whether this might not be due in certain instances to the fact that the hemorrhage was under the scalp or in the muscles, where it was not excreted but was absorbed. It had happened in 1 of his cases that following a profuse hemorrhage under the scalp the temperature ran from 102°F. to 106° F. This was a typical case and was followed by recovery.

DR. ALFRED F. HESS said that this brought up the question as to which was preferable, direct or indirect transfusion. He believed direct transfusion was the treatment of election. He thought it was better than citrated whole blood, since temperature reactions occurred with citrated blood. He thought that final investigations would show that citrated blood was not the same as uncitrated blood.

DR. HELMHOLZ said that most of these cases would recover without direct transfusion. As Zingher had brought out, they could be cured by intramuscular injections of blood which could be given in amounts up to 100 cubic centimeters. The great majority of new-born bleeders could be cured in this way without transfusion.

DR. CHARLES GILMORE KERLEY said he had had 3 cases within a half a year which were entirely relieved by intramuscular injection. One-half ounce injected into each buttock stopped the bleeding just as effectually as the use of the serum by the Welch method. The fact that blood could be obtained so readily for infants and that one did not have the difficulty of separating the serum made this method a very convenient as well as a very satisfactory one.

DR. L. E. LA FÉTRA said that ever since Dr. Schloss had published his method they had been using it. They had employed it in 50 cases, simply making the injection into the loose tissue in the scapular region behind. When the mother came to see the baby they used her blood and this saved the trouble of hunting for a donor, and there was no fear of having to keep the father from work. One did not have to use large quantities of blood; it was more important that the injections be repeated at intervals. If human blood could not be obtained, of course the serum could be used.

DR. KNOX, in closing, said the reason the blood was injected into the vein was because the child was in extremis and it was imperative that they should try to obtain as prompt a response as possible.

#### SKIAGRAM OF A CASE OF IDIOPATHIC DILATATION OF THE COLON

DR. J. P. CROZER GRIFFITH reported this case and presented the skiagraph. The patient was a boy 4 years of age. The circumference of the abdomen was 21 inches and the X-Ray photograph showed very pronounced peristalsis and enormously dilated colon. He had been able to stay the hand of the surgeon and by diet and pituitrin the boy's condition was relieved. He argued in these cases that if the child was in good condition it was better to let him alone than to shorten the colon. He believed resection of the colon was the thing to do if the condition was serious. However, he had stayed the hand of the surgeon in some cases



of dilatation of the colon in which the condition was acquired and had seen the patients do well without operative interference. Of course the cases of dilatation of the colon must be distinguished from pyloric stenosis.

DR. TALBOT said that we all knew of the poor results obtained by the surgeon in these cases. He had been using a well fitting elastic belt that compressed the lower abdomen with very satisfactory results. Since surgeons were getting such poor results in these cases he thought this was a mode of treatment that should be tried out in a large number of cases, so that they might get more definite results as to the effects of this form of treatment.

DR. L. EMMETT HOLT said that a distinction should be made between Hirschsprung's disease and marked intestinal indigestion. He thought that in the mind of the general practitioner these two conditions in children were often confused. Dr. Holt cited a case in which Dr. Osler and he had been able to dissuade the surgeon from operation. The child was put on medical treatment and recovered, gaining 8 pounds in a comparatively brief period of time. The support given to a thin abdominal wall by an elastic belt would in many cases give the needed support. It was sometimes a mistake to operate simply because the X-Ray showed a dilated colon.

DR. GRIFFITH said he wished to emphasize that a distinction should be made between the cases in which there was a stricture and those in which the dilatation was due to intestinal indigestion. Many cases had been reported in which surgery had been a failure in this condition and many more had not been reported. Many cases that have been thought to be stricture had been shown at operation and at autopsy to be purely idiopathic dilatation of the colon.

#### THREE CHILDREN WITH SPORADIC CRETINISM IN ONE FAMILY

DR. CHARLES HERRMAN stated that this was the second time he had had the opportunity of presenting 3 cases of sporadic cretinism in one family. The first series of cases were published in the New York State Hospital, August, 1914, and consisted of 2 boys and 1 girl. The 3 patients now presented are 22, 20 and 18 years, respectively, and had been under treatment

intermittently since they were 3 years old. The eldest was seen by Osler in 1898 and the other 2 by Thayer and Smith. There was no family history of any disease of the thyroid or any other of the endocrine organs. The mother has been pregnant 12 times. These cretins were the third, fourth and sixth births. The ninth and tenth pregnancies miscarried. These children were born in this country, and the pregnancies and labors were normal. The children were breast-fed for from 8 to 16 months, the first teeth appeared at 1 year, they were able to sit alone at 1½ years, at 3 years to walk and speak short sentences. At the age of 2 years it was noticed that they did not develop properly physically and mentally. At the age of 3 they were taken to Johns Hopkins Hospital and were treated intermittently for several years. The older girl began to menstruate at 17 years, the younger at 15. These children came under the writer's observation in March, 1917. At that time their mental and physical development was greatly retarded. The röntgenographical examination showed delayed ossification in all, but hardly as much as one might have expected. At 18 to 20 years union should have taken place between the bases and shafts of the phalanges, the heads and shafts of the metacarpals and the epiphyses and shafts at the lower end of the radius and ulna. The general appearance of the children was that of cretins who have been under treatment intermittently. These patients have now been under treatment for 2½ months with a combination of the extracts of thyroid, pituitary, and suprarenal glands, and had shown marked mental and physical improvement.

In only 5 of the 50 cases of cretinism coming under the author's observation were the parents related. A distinct history of constitutional disease was not more common in these families than in others. Tuberculosis, syphilis and malaria are usually absent. It was also seen in these families having more than 1 cretin that normal children were born between the abnormal. It seemed very unlikely that a constitutional disease in either parent would manifest itself in only one of twins, yet we have observed cretinism in one of twins, or that a mother so affected would have alternately a normal and an abnormal child. It seemed to him that these anomalies of the ductless glands could best be explained on the basis of heredity. The defect was not necessarily of the thyroid or pronounced. Family pedigrees were usually incomplete or inaccurate and it did not follow that

because we cannot elicit a history of such a defect, that therefore none existed.

DR. PISEK expressed the opinion that these cretins were never cured. He did not think they ever got beyond the moron stage. They had to be kept under thyroid treatment for years.

DR. HEIMAN said he had had the opportunity of observing a case of cretinism for years. This one went through school and high school, reached the height of 5 feet 10 inches, and was now a bookbinder. They had given him thyroid after he was apparently well. In these cases the after treatment must be continued forever.

DR. D. J. MILTON MILLER, of Atlantic City, cited a case of myxedema that had been under observation for 20 years and had never recovered. He said it was a question whether these cases ever recovered. This woman continued to take intermittent treatment of thyroid.

DR. HERRMAN, in closing the discussion, said the result of treatment depended upon how early the treatment had been instituted. Some of these cretins reached a normal standard physically. If they were treated early and the treatment kept up they might not become absolutely normal mentally but they were sometimes able to go into business and to get through life with a fair degree of comfort. The vast majority of cases were not treated until they were a year old and then it was too late to expect good results.

#### THE RESTORATION OF MATERNAL NURSING AFTER SIXTEEN DAYS OF COMPLETE INTERRUPTION

DR. THOMAS S. SOUTHWORTH, of New York, said the most important issue in this case was the fact that if the breast milk had not been restored in this instance the infant would have died. The baby was born December 9, 1916, with a reported weight of 9 pounds. It seemed that as a result of the forceps operation at the time of birth the infant's left ear was black and blue and there was a deep mark on the forehead. Nine days after birth severe cellulitis developed which involved the right buttock, the entire lower part of the back from the ribs to the sacrum, and the under surface of the chin and upper part of the neck. There was also a profusely suppurative otitis media of the left ear.

Owing to the erysipelatoid appearance of the cellulitis about the chin, the baby was removed from the breast on December 20, and the mother allowed to return home. The suppurating areas were freely incised. Two weeks elapsed during which time the mother made no attempt to pump her breasts or retain her milk. She then decided to take the baby home, as it seemed probable that the baby would die if it did not receive breast milk. She began taking 1 pint of cornmeal gruel, and 1 quart of milk daily, following definite instructions. At first complementary feedings of malt soup mixture were given after each nursing. After a few days these were stopped and the breast milk sufficed. At this time the infant weighed only 6 pounds and 11½ ounces. From this time the progress was slow but fairly continuous, and he has gradually overcome his various infections, though the otitis media persisted until about the middle of March. While the restoration of breast milk after a complete interruption for 16 days was perhaps not so remarkable, it was well that we should be reminded of its possibility. The measures adopted to this end undoubtedly played some part in the success of the effort, and the urgent need of the baby in this instance made its accomplishment a matter of especial gratification.

DR. SEDGWICK said he could endorse what Dr. Southworth had said, namely, that it was well to be reminded occasionally of the possibility of resuming breast feeding. He had had 1 case in which nursing was resumed after an interval of 9 weeks. He knew of another instance in which it was resumed after 2 months. Instances had been related in the literature in which the grandmother or a virgin aunt had been called upon to suckle a child.

DR. CARPENTER related an instance in which a mother and daughter, Russians, were both nursing babies at the same time. The babies were not thriving, so he had the mother suckle the grandmother's baby and the grandmother suckle her grandchild. Both babies thrived remarkably well.

#### A CASE OF CONGENITAL HEART DISEASE

DR. CHARLES HUNTER DUNN said this was a clinical report of a case in which the diagnosis of congenital cardiac disease was obvious from the physical examination of the heart. The presence of a palpable systolic thrill, of persistent cyanosis, and of cardiac enlargement, suggested the presence of pulmonary stenosis. The fact that the child survived for 15



months suggested the presence of some additional compensating lesions, either defective ventricular septum or open ductus arteriosus. The absence of the humming top murmur, or the transmission of the murmur into the vessels of the neck suggested that the additional lesion was defective interventricular septum rather than open ductus arteriosus. The clinical diagnosis in this case was as follows:

Pulmonary stenosis, defective interventricular septum, chronic intestinal tuberculosis, chronic tuberculosis of the mesenteric lymph nodes, possible tuberculous peritonitis, rickets and a terminal bronchopneumonia. At autopsy the heart showed very marked enlargement. The point of origin of the aorta and pulmonary arteries respectively were reversed, the aorta rising in front and to the right and the pulmonary artery behind and to the left. The foramen ovale was entirely open. The tricuspid and mitral valves were normal except for the widening of the orifices produced by the dilatation of the ventricles. There was some hypertrophy of the wall of the left ventricle, and marked dilatation of the cavity of the right ventricle without notable hypertrophy of the walls. The aortic orifice was situated, not in the left ventricle but in the right ventricle somewhat farther forward than the normal position of the pulmonary orifice. The pulmonary orifice was situated in the left ventricle in the position normally occupied by the aortic orifice. It showed marked stenosis. There was an oval opening in the ventricular septum 5 centimeters in diameter situated in the usual position of the lesion. The principal interest in this case lay in the transposition of the great vessels, which was a comparatively uncommon lesion in congenital cardiac disease.

There were two forms of transposition of the great vessels. In the one form the aorta arose in front and to the right, while the pulmonary artery arose behind and to the left, but each vessel arose from its proper ventricle. This form was called corrected transposition. In the other form, not only is the position of the origin of the great vessels reversed, but the aorta opened from the right ventricle, and the pulmonary artery from the left ventricle. This was called complete transposition, and was the form found in the present instance. In most of the reported cases the lesion had been accompanied by other lesions. There were a few reported cases in which the complete transposition was the sole lesion. In these cases the only clinical manifesta-

tion was persistent cyanosis, there being no murmur and no cardiac enlargement.

The most plausible explanation of the lesion was that of Rokitsansky. In the conus arteriosus which formed the upper part of the primitive aorta, the formation of the transverse aortic septum placed the lumen of the aorta in front. The torsion which brought the opening of the aorta behind was due to a kinking in the bulbus cordis, which forms the lower part of the primitive aorta and pulmonary artery. This torsion was represented by the spiral arrangement of the septum in the bulbus cordis. If this normal kinking and torsion did not occur, or was slightly reversed, the aorta would arise in front and to the right, the pulmonary artery behind and to the left. In the first form of transposition there was a sympathetic adjustment of the interventricular septum in its union with the aorto-pulmonary septum, which caused each great vessel to open into its proper ventricle. This form was called by Rokitsansky "corrected" transposition. In the second form the interventricular septum united with the malposed aorto-pulmonary septum without sympathetic adjustment, causing the aorta to open from the right ventricle. This was called complete transposition. The remarkable feature of this case was that the child should have lived so long, especially with the additional handicap of abdominal tuberculosis. The transposition of the great vessels must produce serious disturbance of the circulation. The only way in which any venous blood could be aërated was by passing through the open foramen ovale or open ventricular septum into the left side of the heart, often being sent out through the narrowed lumen of the pulmonary artery.

A CASE OF MENINGOCOCCUS MENINGITIS IN THE NEW-BORN, WITH  
INTERESTING AND UNUSUAL FEATURES

DR. J. MILTON MILLER said that this patient at 2 weeks of age developed slight fever and a purulent conjunctivitis which was thought to be gonorrheal. It, however, cleared up under argyrol, but the fever continued. On the abdomen and upper right thigh and groin a number of giant vesicles developed some 2 weeks later. For 10 days the patient had these symptoms but no nervous symptoms and no vomiting or convulsions. The reflexes were negative, leukocytes 21,000, culture from the jugular vein negative. The continuous fever, 101°F. to 103°F., was attributed to the bullæ, whose contents had

become clouded. After the symptoms had continued for about a month, lumbar puncture was performed. The first lumbar puncture was dry; the second brought about 30 minims of clear, yellow fluid which coagulated at once into firm, jellylike clot. Examination was for this reason unsatisfactory. At a fourth lumbar puncture a few days later only 1 or 2 drops of fluid were obtained and this coagulated in the needle. Finally the signs developed which made the diagnosis of meningitis apparent. The patient was treated with Flexner's serum. Two withdrawals of  $\frac{1}{2}$  ounce of ventricular fluid were followed by the introduction of 20 cubic centimeters of Flexner's serum. The child's general condition remained unchanged. A few days later 1 ounce of fluid was withdrawn from the fontanel and 20 cubic centimeters of serum introduced. Several similar injections were given after the withdrawal of fluid. Finally an attempt to wash out the spinal canal with saline solution through two needles at different levels failed, fluid refusing to enter the canal. Other punctures and serum injections were made, but the patient finally died. Autopsy showed a suppurative meningitis; sections did not show the presence of the meningococci. The following features seemed to be of particular interest: 1—The inset with conjunctivitis, mistakenly regarded as gonorrheal. 2—The bullous eruption in the second week of the disease. 3—The prolonged latent period before signs of meningitis were apparent (fourth week). 4—The peculiar character of the spinal fluid. It gelatinized at once upon withdrawal. Dr. Kolmer said the condition of xanthochromia and massive coagulation was very unique and uncommon in meningococcus meningitis. It was found in various chronic conditions bringing about space constriction in the spinal circulation, with congestion and stasis of the spinal fluid. 5—The large number of punctures of the fontanel, 10, in so young a patient, with no apparent ill effect beyond vomiting. 6—The large amount of serum introduced 260 cubic centimeter in all, with no sign of serum disease. 7—The remarkable sclerema of the skin persisting throughout the attack. 8—Apparent improvement after the tenth injection of serum, with subsequent return of symptoms and death.

#### ACCIDENTS IN FOREIGN PROTEIN ADMINISTRATION

DR. CHARLES GILMORE KERLEY reported these cases. He said the first patient was a boy 8 years of age who had suffered from asthma since 2 years of age. He was sens-

tized to rag weed, maple, golden rod, and horse serum. He had attempted to immunize the boy by giving  $\frac{1}{2}$  minim doses of horse serum. This dose was followed by a local reaction but no constitutional symptoms. This dose was repeated at 2-week intervals and then increased until 4 minims were given, when the child suddenly showed extreme pallor and the typical symptoms of anaphylactic shock. Recovery was very slow but complete. The boy had been desensitized to horse but still had trouble with the maple.

The second case was a girl, 7 years of age, who suffered greatly from asthma and was found to be sensitized to wheat, oats and barley. To injections of each of these she responded by a local reaction, a large wheal forming at the site of the injection. During the course of treatment she one day developed a very violent reaction just after leaving the office. It was presumed that the protein injected had been sufficient to produce this violent reaction.

The third case was a baby that responded to the scratch skin test with milk. She was given 8 drops of Walker-Gordon milk and went into collapse. Her condition was not as severe as that of the boy who was susceptible to horse serum.

These cases were cited simply to show what unexpected reactions might occur in the process of desensitization in these cases.

DR. D. J. MILTON MILLER said he did not believe anyone should attempt the treatment of these cases unless he was familiar with the use of these proteins. He related an instance in which a child sensitized to egg was given a small amount and a very severe reaction followed. He thought that these cases should be sent to someone accustomed to treating this condition.

DR. TALBOT said the feeding of foreign proteins was safer than giving them subcutaneously. They had no fatal cases recorded from giving the proteins into the intestinal tract, but when they had been given under the skin there had been fatalities.

DR. B. RAYMOND HOOBLER said he had had several cases and could confirm what Dr. Talbot had said. He had just finished a series of cases. They started in as low as 10 milligrams



and gave up to 50 milligrams in some instances before the reaction was shown. They made the scratch test with dried egg or put it on the mucous membrane of the tongue. They then used a little white of egg boiled and gradually increased the amount until the child could take a teaspoonful without bad result. Then every day some egg was given until immunization was complete.

They had also been making injections per rectum particularly in that type of case not able to take cow's milk without developing erythematous eruption.

DR. TALBOT said he believed that all such reactions were protein reaction; there was no proof that there was anything else that caused anaphylaxis and it was up to those doing the work to show that fats or carbohydrates could do it. Pure protein could be obtained from all vegetables, but it was frequently present in very small quantities.

DR. DAVID M. COWIE called attention to the work of Professor Novie, who spoke of the possibility of overcoming anaphylaxis by rendering the urine alkaline by the administration of potassium acetate and he reports a group of cases that have been cured by the alkaline treatment. They had had a series of eczema cases that had been improved under anti-anaphylactic treatment.

DR. KERLEY, in closing, said the discussion had wandered a little from "accidents." Altogether he had treated 107 cases and had had only a few accidents. He appreciated what had been said about giving the proteins by the stomach route, but that was not practical in the boy sensitized to horse. In the use of the serum, after 1 minim was given it produced only a local reaction and it seemed reasonable so long as that produced only a local reaction to think that the treatment could be continued. The cases were simply reported to show that in the matter of protein therapy the experiments with proteins should be very carefully carried out.

#### A CASE OF APPENDICITIS IN A NINE-MONTH-OLD BABY, WITH THE AUTOPSY REPORT

DR. ISAAC ABT reported this case. He stated that the child gave a history of having had bronchitis off and on and doctors had told the mothers the child had a slight heart murmur. The physical examination showed the throat slightly injected, tongue

coated, slight cyanosis of the face and lips, and respiratory movement apparently interfered with. There were harsh sounds throughout the chest. Examination of the heart, abdomen and extremities was negative. All the signs and symptoms were referable to the chest. At autopsy a perforating appendicitis was found.

#### A CASE OF PNEUMOTHORAX IN A TWELVE-YEAR-OLD BOY

DR. ABT reported this case, in which the history was apparently negative until three weeks before he saw the child. The trouble began with a cold and there was no dyspnea until 4 days before admission to the hospital. This had continued to increase, becoming very severe. The thoracic cavity was aspirated and the catheter left in. Later incision was made and a tube inserted. The right side of the chest and abdomen became swollen; the following day the face became edematous. The pneumothorax extended laterally as far as the mid-clavicular line. The heart was crowded to the left. The patient died.

DR. SEDGWICK said they saw children just after they were born and about a month ago had a case which on the second day developed a marked pneumothorax. This child did not die but slowly recovered. A series of X-Ray pictures taken showed the marked pneumothorax in the beginning and then the daily diminution. They had been unable to determine the cause of the pneumothorax in this case.

DR. T. DEWITT SHERMAN, of Buffalo, related the history of a case in aspiration of the chest was followed by an emphysema which caused death in a very short time. They had been taught to aspirate when there was fluid, but this case had taught him that there was danger of aspirating the lung even when it was very carefully done.

DR. GERSTENBERGER, of Cleveland, asked Dr. Abt if the opening was large enough so that it could be kept open and relieved of pressure sufficiently to permit the viscera to return to their normal position. He said he had a case with marked anterior emphysema which seemed to improve by leaving the needle in the chest for 6 or 8 hours. He thought it advisable to leave an opening large enough to prevent pressure and choking to death.

DR. HENRY F. HELMHOLZ said he had had a case somewhat similar to Dr. Abt's first case, the appendicitis case, in which he thought he was dealing with a lobar pneumonia on the right side. Later symptoms of peritonitis developed and he thought it was a pneumococcus peritonitis. At autopsy an appendicitis and a focus of infection in the gall-bladder were found. Whether the primary focus was in the appendicitis he could not say.

DR. GRIFFITH related a case somewhat similar to those of Dr. Abt and Dr. Helmholtz in which the diagnosis was very obscure and at autopsy a perforating appendicitis was found. Dr. Griffith asked whether the members of the Society would trust the X-Ray appearances in suspected pneumothorax.

DR. ABT replied that the X-Ray men said there was no doubt that pneumothorax could be diagnosed by the regular contour and the decidedly black areas that showed the air-containing pulmonary cavities.

#### HEREDITARY MULTIPLE EXOSTOSES

DR. DAVID MURRAY COWIE said cases of so-called hereditary multiple exostoses were rare enough to warrant the publication of an unusually marked case. The patient, a boy 10 years of age, came under his observation as a referred case from the University Hospital, where he had been operated on for double mastoid. The physical examination was negative except for the multiple outgrowths and irregular thickenings of most of the skeleton, many of which were plainly seen on casual observation. The involvement was quite definitely symmetrical. In the upper extremities the humerus, radius and metacarpal bones showed thickening and exostoses. The carpal bones showed no deformities, ossification being incomplete and retarded. The femur showed thickening of the neck with blunt outgrowth projecting forward and downward. There was thickening of the lower ends with marked spinous outgrowths projecting upward on the inner and outer aspects. The tibia showed many spines projecting downward about the head. Small spines were to be found projecting downward at the costocondral junction of all the ribs. The clavicles and scapulæ were involved in the process, and the large pelvic bones showed the same irregular outline seen in the scapulæ. The transverse processes

of one of the lumbar vertebræ showed distinct changes. No prominences could be felt on the head.

The father of this boy showed similar, large, but not so numerous, skeletal changes as those of the son. Radiograms of the wrists, hands and knees were made. The lower ends of the radius and ulna were greatly thickened and distorted. The forearms were distinctly shorter than normal; the metacarpal bones were irregular in shape, occasionally thickened, and in a few places showed slight evidences of exostosis. The knees were greatly deformed. The bony changes were peculiar in that most of them were spurlike and the affections seemed to have had comparatively little effect in hindering most of the bones from acquiring their normal length and size. None of the spurs showed evidence of previous fracture.

Genetically, multiple exostoses are of two main varieties. Cartilaginous exostoses which were probably the most common and fibrous exostoses. Cartilaginous exostoses arose from the periosteum, marrow or epiphyseal cartilages and developed in much the same way as the long bones. Fibrous exostoses were those in which connective tissue developed from the periosteum without any proliferating cartilage cells. They were more commonly seen on the surfaces of flat bones, skull or scapulæ. Nothing definite was known of the cause of this peculiar skeletal anomaly. Heredity was a definite factor. In this group no definite infectious agent seemed to be at work. Enough cases of hereditary multiple cartilaginous exostoses had been recorded to warrant considering the process a disease entity. In this case the Wassermann and tuberculin reactions were negative. The disease should not be confused with myositis ossificans not infrequently seen in children.

DR. ALFRED F. HESS said that he had recently seen a case very much like Dr. Cowie's. There were 3 children in one family, aged 10, 6 and 2 years. The boy of 10 years had marked enlargements, especially of the head of the humerus. The exostoses were sharp like spinous processes, especially those of the ribs. In the child of 6 the process was less developed, and in the child of 2 it was just beginning. In this instance the father had exostoses of the knees. Dr. Hess asked whether the literature showed that this condition was hereditary in the male line like hemophilia and color blindness. He also asked what treatment Dr. Cowie had to suggest, what he



thought of parathyroid and if the condition had anything to do with calcium.

DR. COWIE said he knew of no case going back further than the father among 220 cases recorded. There was no treatment that had been systematically employed. When the outgrowths became so great as to interfere with comfort or motion, surgery might be instituted. Dr. Cowie said he had made calcium estimations of the blood but they did not seem to show anything particular. The exostoses as the pictures showed developed at the foot of the muscle. As to the heredity the literature seemed to show that it came sometimes through the father and sometimes through the mother.

#### SARCOMA OF THE BRAIN SIMULATING HYDROCEPHALUS

DR. L. EMMETT HOLT reported this case. He stated that the child was perfectly normal at birth, weighing 6 pounds 5 ounces. The parents were Russians, normal, healthy people, with no hereditary disease. The child was admitted to the hospital when 7 weeks of age. The parents said they had noticed the beginning enlargement of the head when the child was 2 weeks old. At 7 weeks the head measured  $20\frac{1}{2}$  inches in circumference and the chest 15 inches. The only symptoms the child presented was the enlargement of the head. There was no paralysis and no local symptoms. There was asymmetry and a prominence over the left frontal bone. The only symptoms were those of an ordinary hydrocephalus and hernia cerebri. The reflexes were increased and the temperature subnormal. At autopsy the right hemisphere of the brain was found to be quite normal but the left was found to be the seat of a large sarcomatous growth. Dr. Holt said the unusual features of the case were the absence of symptoms other than those of hydrocephalus and the rapid growth of the tumor. He had never seen a similar growth so early in life or one that grew with such extraordinary rapidity.

#### CHYLOTHORAX IN AN INFANT

DR. GODFREY R. PISEK said this patient was an Italian baby 2 months and 1 week old. There was nothing in the previous history to account for the condition. The baby had no illness until 10 days previous when she had a convulsion. There were no other symptoms except rapid and

difficult breathing, with no rise in temperature or cough. On the day seen by the speaker the baby had also refused to nurse and was cyanotic. Its stools had become greenish yellow. Except for distinct areas of flatness over the right chest posteriorly with corresponding diminution of breath sounds and slight displacement of the heart the physical findings were negative. A pleural effusion was suspected. At aspiration 6 ounces of milky fluid were withdrawn. The laboratory reported that the milky fluid was sterile, composed of fat and seroglobulus. It was apparently a true emulsion. No evidences of causative factor could be demonstrated. For 5 days the child continued to improve when the hyperpnea returned and child was again aspirated with marked relief. The blood examinations showed red blood corpuscles 6,350,000, white blood corpuscles 15,000, hemoglobin 70%, polymorphonuclears 55%, eosinophiles 3%, large lymphocytes 5%, small lymphocytes 36%. The radiograph showed an effusion in the right thorax with some displacement of the heart and mediastinal contents to the left. There was partial collapse of the right lung. The baby was allowed to go home 22 days after its admission, being then in good condition. It remains at the present time in apparently good condition and has gained in weight. The case was reported because of its rarity from the standpoint of prognosis. In the literature it was necessary to distinguish between true and pseudo-chylothorax. This was probably the youngest case on record, namely, 9 weeks.

The etiological factors here could be assumed only and attributed to the convulsive seizure, which might have changed the pressure of the duct and caused rupture. Cure could only be surmised and accounted for by a probable enlargement of the anastomosing lymph branches which connected the thoracic with the right lymphatic duct.

DR. T. DEWITT SHERMAN stated that he had reported a case of true chylothorax in a boy in 1907 and had presented the sample of the chylous effusion. In this case he had aspirated 3 times, drawing off 840 cubic centimeters the first time, 260 cubic centimeters the second, and 1,200 cubic centimeters the third time. They were afraid to withdraw too much fluid the first two aspirations. After drawing off the 1,200 cubic centimeters the third time the boy went on to recovery. He had made the aspiration as low down as he could.

THE TREATMENT OF SECONDARY ANEMIA IN INFANTS BY  
BLOOD TRANSFUSION

DR. CHARLES GILMORE KERLEY said the cases included in this report were referred to the writer because of simple secondary anemia or because of anemia and malnutrition. Various food combinations had been tried and all had received medical treatment for the anemia. The transfusions were made at the Babies' Hospital. The blood of the donor was proved fit by the absence of agglutination and hemolysis. The technic employed consisted in cleansing and cocainizing the skin over the median basilic vein of the child's arm and exposing about 2 centimeters by dissecting it free from surrounding tissues. A small opening was made into one side of the vein with a pair of scissors and a Lindeman needle inserted. The vein below the needle was then tied off and another suture was placed over the vein and needle to hold the needle in place. A small amount of sterile salt solution was introduced to make sure that there was no leakage. A rubber tourniquet was placed on the arm of the donor and the skin cleansed over the most prominent vein, and the blood drawn with a record syringe until it was full. This syringe was then handed to the operator working on the child and the blood inserted into the child's vein. At the same time a fresh syringe full of blood was being obtained from the donor. Each syringe was well washed out with sterile salt solution before being used again to collect blood. This procedure was continued until the required amount had been transfused. The results were shown by a chart. There were 8 cases in the series and the blood examination before and after the transfusion showed the effect of the transfusion in each instance. The results in all but 1 of these cases were satisfactory. One case was transfused twice and in each instance there was an improvement as shown by the blood examination, but it failed to hold longer than a few weeks. The abdomen in this case was greatly distended not unlike Hirschsprung's disease. In the other cases there was no return of the anemia and subsequent growth and development was all that could be hoped for. The children were all under 2 years of age. Dr. Kerley said he had tabulated the weight increase and the blood findings, but the table could not record the magical change in the patients, the change from sickly, whiny infants into happy apparently well infants. These patients were transformed from those with a digestive capacity

barely able to maintain existence into those that took on the normal constructive processes of early life.

THE VALUE OF THE VON PIRQUET TEST AS CONTROLLED BY  
AUTOPSY FINDINGS

DR. J. H. MASON KNOX, JR., said the object of this paper was to report the results of a study of the von Pirquet test for tuberculosis upon a series of children who had died and upon whom careful autopsies had been performed. This investigation was carried on at the Harriet Lane Home of John Hopkins Hospital in the service of Dr. John Howland. Careful autopsies were performed on 324 infants and children, from birth to 12 years of age. Sixty-eight cases were found to have tuberculous lesions on postmortem examination; that was about 20% of the fatal cases examined after death. Two hundred and fifty-six, or 80%, were found at postmortem examination to be free from tuberculosis. This incidence of tuberculosis in infancy and childhood agreed with the results of Veeder's investigations, and is much smaller than is reported in European centers. As has been repeatedly found, the number of tuberculous cases increased rapidly with the age of the patient. Koch's old tuberculin, undiluted, was used and the scarification done by the borer devised by von Pirquet. Readings were made in 24 and 48 hours. Of the 25 cases having no tuberculous lesions at autopsy, the test was never positive, but negative without exception. It should be emphasized that no doubtful cases should be called positive, but the test repeated; only those should be called positive in which there is a marked contrast between the tuberculin treated areas and the control site. This result seemed to furnish most reliable confirmatory evidence among American children that a properly performed negative von Pirquet reaction, except in extremely ill children, precludes the possibility of tuberculous infection.

Of the 68 cases in which tuberculous lesions were found at autopsy, the von Pirquet reaction was made in 61; of these it resulted positively in 45 cases, and negative in 16. In 12 of these latter the patients were suffering from rapidly advancing widespread miliary tuberculosis; in 2 instances from tuberculous meningitis; in 2 from pulmonary tuberculosis of advanced stage with cavity formation, and in 1 instance from tuberculous peritonitis. In all instances the test was made from a week to a few



days before death, usually several weeks after the onset of illness. It could fairly be concluded from their figures that a positive cutaneous test indicated the presence of a tuberculous lesion, but that a negative test in patients extremely ill might frequently fail to react positively.

The tabulation of the tuberculous cases showed that 44 of the 68 cases are colored and 24 white; of 7 fatal cases under 6 months 5 are colored and 2 white. These results would strengthen the view that tuberculosis was much more prevalent among the black than among the white races, in proportion to their numbers and that tuberculous infection occurred at an earlier period of life in the black. It might be concluded that the cutaneous test with tuberculin, as described by von Pirquet, was a most reliable aid in the detection of tuberculosis in children; that a positive reaction invariably indicated a tuberculous focus and a negative reaction established the fact that there was no tuberculous lesion except in extremely ill patients.

DR. CHARLES HUNTER DUNN said that they had been carrying out similar investigations and were helped by the fact that all infants dying in the hospital were autopsied. Every case that came into the hospital was given an X-Ray examination and the von Pirquet test. They had made between 200 and 300 autopsies in children under 2 years of age and found that the incidence of positive reactions had been over 50%. The percentage of persistently negative reactions had been 30%. Not more than 1 or 2 cases in that series showed a positive reaction with negative findings at autopsy. Dr. Dunn expressed the belief that there was a variation in the manifestations of tuberculosis and in the number of positive von Pirquet reactions during different periods. Those periods were longer than 1 year; they might be 5 or 10 years. To get statistics of value as to the incidence of tuberculosis in children it seemed that they would have to cover a period of 100 years and investigate a million cases.

DR. L. EMMETT HOLT said it had been their experience that it was very exceptional to find a positive reaction and not to find tuberculosis at autopsy. The only exceptions were those Dr. Knox had given. It was said that it was exceptional to find a positive von Pirquet reaction in tuberculous meningitis. They had found positive reactions in tuberculous meningitis except in those cases that were practically moribund.

DR. HAMILL said his experience had shown, just as had Dr. Abt's, that there was difference in tuberculins. His experience with tuberculous meningitis was like that of Dr. Holt's. He had obtained a positive von Pirquet reaction within 24 hours of death in tuberculous meningitis.

DR. ALFRED F. HESS stated that at the Infant's Asylum in New York, Dr. Bass had been doing the von Pirquet tests. They made 3 intracutaneous tests within 12 days. Quite a number that gave a negative reaction on the first test had given a positive reaction on the second test and still more on the third test. A comparison of the tests for the past 2 years showed a very high percentage of positive reactions. Dr. Hess said he did not believe that one negative von Pirquet reaction meant that there was no anatomical tuberculosis present.

THE EFFECT ON HUMAN MILK PRODUCTION OF DIETS CONTAINING  
VARIOUS FORMS AND QUANTITIES OF PROTEIN

DR. B. RAYMOND HOOBLER said their knowledge of the proper diet for nursing mothers whose milk supply was not sufficient, or was failing, was inadequate. The present study attempted to determine the effect of diets containing various amounts and kinds of protein on the production of human milk. What was the minimum amount of protein that should be fed to protect maternal tissues, that was what nutritive ratio should exist between the protein on the one hand and the carbohydrate and fat on the other? Was there any difference between animal and vegetable proteins in their effect on milk production? If so, which was best? Was one kind of animal protein better than another to protect maternal tissues? In this investigation some 12 different diets had been tested. The results obtained from a purely vegetable diet suggested the futility of excluding from the diet at least a certain amount of animal protein. Many mothers were trained during the latter part of their pregnancy to eliminate albuminous food from their dietary because of albuminuria. The fear that albuminuria might persist caused these women to continue a low protein diet which frequently was the cause of a failing milk supply.

In summarizing it might be said that: 1—A nutritive ration of 1 to 6 seemed best adapted to the need of nursing mothers. This ratio referred to the proportion of digestible protein to

digestible fat and carbohydrate, the latter reduced to a carbohydrate basis. 2—Animal protein was more suitable than vegetable protein in supplying nitrogen for milk and maintenance of the nitrogen balance. 3—The protein when derived from nuts and when fed with other vegetable protein was suitable for supplying milk protein and for maintaining nitrogen balance. 4—A diet composed exclusively of cereals, fruits and vegetables did not supply sufficient protein for elaborating milk protein and caused a severe drain on the tissues of the mother. 5—Of the various forms of animal protein, that derived from cow's milk seems particularly suitable for the production of human milk protein as well as for the preservation of maternal tissues. It was found that a diet that would just maintain the nitrogen equilibrium was in many respects preferable to one which tended to add weight.

DR. ABT said he was not in a position to criticize the figures, but it was not as simple a matter as it was represented to be. He said he would like to know about the weights and ages and races of these mothers and about their physical condition. One little woman weighing scarcely 100 pounds might produce 100 ounces of milk, while another stout woman might produce very little. One woman might live in luxury and produce no milk, while another might live very plainly and in poverty and produce an abundance. It was said that during the siege of Paris more mothers nursed their babies than at other times. This was not a question of diet at that time. The problem was of feeding a certain amount and kind of food and getting a certain amount of milk; it was a much more complicated problem than that.

DR. HESS said it must be remembered that although animal protein produced more milk, yet the animals that produced the most milk got no animal protein. An animal getting no animal protein would produce milk containing two or three times as much protein as human milk when the mother was taking animal protein.

DR. THOMAS S. SOUTHWORTH said that one of the most important factors in the diet of the mother was to furnish a supply of protein sufficient so that she did not need to draw on her own tissues. He stated that the diet he was giving kept the milk supply up to normal and did not draw on the tissues of the mother; such a diet was made up of carbohydrates and a sufficient amount of milk.

DR. HOOBLER, in closing, said that the 8 mothers were observed during a period of 3 months. A few of the mothers were on the nut diet and on the other 10 diets. The diets were not based on a per kilogram body weight. The milk was obtained by hand milking under the careful supervision of a nurse and the breasts were emptied every 4 hours. It seemed to him that the greatest fault in their estimations was that they dried the milk in making the estimations of the caloric value. The age of the mothers was about 30 years and these were their first babies.

#### LUETIC NEPHRITIS IN INFANCY AND CHILDHOOD

DR. WILLIAM W. BUTTERWORTH said that not infrequently instances of nephritis were met with in infancy and early childhood, for which no etiological factor, other than congenital lues, could be reasonably ascribed. A search of the literature showed that apparently little recognition was given to luetic nephritis by English and American writers. More than 25 years ago French authors gave it a distinctly clinical etiology in the nephropathies. German writers had studied the subject from both the clinical and pathological side and have made painstaking and extensive contributions to the literature. Lately Italian observers have made valuable additions to our knowledge. Karvonen's exhaustive summary and work in 1900 gave stimulus to further and more extensive clinical observations. While there was a lack of agreement in regard to the severity of the syphilitic infection and its effect on the kidneys, upon two points there was a more complete understanding. First, the clinical symptoms of nephritis in hereditary syphilis might be wanting, or so insignificant as to pass unnoticed. Repeated examinations of the urine might be necessary to establish a diagnosis. Second, if the child survived the early period of life, then the clinical manifestations were those commonly associated with a chronic interstitial nephritis. From his own clinical experience and from a study of reported cases, it could be said that congenital luetic nephritis presented nothing unusual in its clinical manifestations and that each case was modified by its own individuality, and conformed more or less to certain classifications or types, as follows: 1—Acute parenchymatous nephritis, which may be hemorrhagic. 2—Acute interstitial nephritis. 3—Chronic interstitial nephritis. 4—Myeloid degeneration. 5—Gummata of



kidney. Fetal syphilis might result in various kidney changes such as congenital malformations, cystic kidney and nephritis. Infants and children who presented clinical evidences of an heredo-syphilitic nephritis during life usually did not show gross macroscopical changes in the kidneys. However, almost without exception abnormal and characteristic histological findings were found in these cases. Several observers had recently demonstrated active, well-formed *Treponema pallidum* in the vascular, interstitial and parenchymatous renal tissues. The cells of these tissues when attacked by the *Treponema* presented a progressive phase of cell degeneration. The organism might be found generally diffused throughout the kidney or might be localized. These observations supported Karvonen's toxic theory, and formed reasonable hypothesis for the complex clinical manifestations and diverse urinary findings in the kidney change of hereditary lues. A preponderance of organisms either by the vesicular, interstitial or parenchymatous tissue, combined with the extent of involvement and with a diffusability or localization of organisms, might explain the individual tendency to ascertain types of nephritis. Living active *Treponema pallidum* have been found in the urine of a 4-month baby who died of congenital syphilis. The urine of congenitally syphilitic children contained a specific poison, probably an alkaloid which when injected into animals caused death. Castaigne in 1913 called attention to a familial albuminuria dependent on hereditary syphilis. He reports 12 personal cases of albuminuria in children. These occurred in 4 families. All had positive Wassermann's. Two of the children died of nephritis, the other 10 were apparently cured by specific medication. Congenital syphilis was often not the only cause of family albuminuria. Judicious specific medication was curative in most of the cases. Congenital luetic nephritis was not generally recognized as having a distinct etiological basis.

#### THE FACTORS INVOLVED IN VARIOUS HEMORRHAGIC CONDITIONS

DR. WILLIAM PALMER LUCAS discussed the factors concerned in the coagulation of the blood. He described the methods for testing fibrinogen, antithrobin and prothrombin and their place in hemorrhagic conditions. He also considered such factors as the blood platelets, blood vessels and blood proteins and suggested a uniform method of studying hemorrhagic conditions.

## THE EFFECT OF COD-LIVER OIL IN INTESTINAL INFANTILISM

DR. L. EMMETT HOLT read this paper in which he reported the case of a girl  $8\frac{1}{2}$  years of age who was suffering from intestinal infantilism, apparently due to chronic intestinal indigestion. Metabolic observations showed negative balances in calcium, magnesium, phosphorus and total ash. At  $8\frac{1}{2}$  years the weight of this child was  $27\frac{1}{2}$  pounds net and her height 39 inches. With administration of cod-liver oil she gained in 9 months  $2\frac{1}{2}$  inches in height and  $13\frac{1}{2}$  pounds in weight. Metabolism observations at the end of that time showed marked positive balances in calcium, magnesium and total ash. How much of this improvement was due to improved digestion and how much to the cod-liver oil was difficult to tell.

## INDICANURIA IN CHILDREN

DR. H. M. MACCLANAHAN, of Omaha, said that an extensive search of foreign literature and also of that of this country showed that many authors made no mention of it while others devoted perhaps a page or less to it. The natural conclusion was that the subject was not of any importance. Indican of intestinal origin was found in the urine of children in the following conditions: Constipation, chronic intestinal indigestion, duodenal and peptic ulcer, malignant growths and in all forms of acute obstruction of the bowels as volvulus, ileus and intussusception. Second, indican was produced in suppurating cavities within the body. In empyema, pulmonary abscess, bronchiectasis, pulmonary gangrene, chronic tonsillitis, appendicitis, and in general pyemic conditions.

The writer had made a careful study of his office cases including the records of the years 1913 and 1916, inclusive, having kept notes on 1,657 urine examinations. Many of these were in children suffering from some organic disease. In a number but one examination was made. Indican was found in 1,341 examinations and was absent in 316. In many cases there was found only a trace. The urine of 536 children varying in age from 4 to 12 years was studied, none of whom had any organic disease. All cases were eliminated from the list where other abnormal products were found. The test for indican uniformly employed was hydrochloric acid, 30 minims; nitric acid, 1 minim; urine, 10 minims, and chloroform up

to 15 minims. The amount of indican present was determined by the intensity of the color. Of this series of cases 20 were hospital cases, 6 of which were suffering from empyema. All were subjected to operation. Indican was found in excess in all cases. In 5 that recovered indican either disappeared or there was only a trace when they left the hospital. One of the cases terminated fatally. There was 1 case of pulmonary abscess in which indican was constantly present. Three cases were of acute appendicitis and in these indican was present but disappeared after recovery. Indican was present in 1 case each of duodenal ulcer, acute ileus and 1 case of pyonephrosis, in 2 cases of bronchopneumonia and 2 cases of typhoid fever. In the 516 ambulatory cases indican was present in greater or less degree. In 97 there was a trace of indican, and in 367 indican was present in excess; in 52 the urine was loaded with indican. Medical advice was sought in these cases for such reason as the following: Constipation, indigestion, bad breath, poor appetite, excessive appetite, restless sleep, bloating, coated tongue, irritability, worms, sallow complexion, enuresis, mental dullness, vertigo, foul stools, headache and liver trouble. In a large number of the older children there was evidence of bad teeth. Nearly all of the group had some form of indigestion. Of the 516 cases 337 on a second examination showed either decrease or absence of indican and in the remaining 179 cases indican persisted. Of the 52 cases showing excessive indican all were cases of constipation. In 3 cases in which the indican persisted after careful dietetic and hygienic treatment the X-Ray showed some abnormal condition of the bowel. Many of these children were bolting their food or were permitted to eat between meals. Eleven cases in complete co-operation of the mothers were secured and placed upon a diet eliminating meat, eggs and milk entirely for a period of 10 days. They were given a diet solely of fruits, cereals, green vegetables, toast, bread and butter and were permitted to drink water freely. After this treatment and a free bowel movement daily the urine of each child without exception showed absence of indican. In conclusion it might be said that indican was present in the urine of the majority of children. A trace was probably normal. Excessive indican was evidence of either intestinal putrefaction or of some mechanical injury of the mucosa or to some suppurative process within the body. Indican was frequently present as the result of constipation. It might have a very important diagnostic value.



CLINICAL OBSERVATIONS OF POLIOMYELITIS DURING THE 1916  
EPIDEMIC; PROPHYLAXIS; DESCRIPTION OF A CHARACTERISTIC SIGN

DR. HENRY HEIMAN said it was almost impossible to improve upon Wickman's excellent classification of poliomyelitis; even this classification, however, did not cover all the types of the disease seen in the last epidemic, the largest ever known. Velum palati paralysis and bilateral ophthalmoplegia, for instance, were rare in previous epidemic, but more rare last summer. The last epidemic had demonstrated conclusively that poliomyelitis virus might attack any site in the entire cerebrospinal tract. It was interesting to note that in the midst of the epidemic it was comparatively easy to demonstrate certain distinct clinical types of cases, occurring about the same time, in certain localities, and presenting practically the same symptoms and signs. Observation in this respect seemed to indicate that there were probably a number of strains of the poliomyelitis organism varying in virulence, and having a predilection for certain regions of the cerebrospinal tract, therefore producing certain specific manifestations. It was usually conceded that Lugge's droplet infection was, in most cases, responsible for the spread of meningitis. There was reason to believe that the virus of poliomyelitis was very likely transmitted by the same means. This does not necessarily mean from patient to patient, but that in many instances the source of communication was a healthy carrier. Therefore, in order to control the spread of poliomyelitis, we must devote our attention to prophylactic measures. These were pre-eminently the gown, the cap, the hand-brush, and the disinfectants. There were other important measures which had not been sufficiently emphasized. These were the wearing of a gauze mouth piece and nose mask, or gargling of the throat and spraying of the nose, the last to be employed before and after visiting the patient. It would seem advisable for all persons during an epidemic to pay special attention to the cleansing of the nose and throat.

In reference to diagnosis there are certain points which required emphasis. The most transient paralysis, the slightest paresis of the extremities, the faintest suspicion of rigidity of the neck, inability to flex the head (Draper's sign), the mildest muscle pain or cramps, occurring during an epidemic, should be sufficient evidence to regard the case at least as one of



potential poliomyelitis. In connection with this he called attention to a sign, especially observed in cases of the meningeal type, and which has aided me in a number of instances in making the diagnosis of this disease. This is a distinct tremor of the hands and fingers, a fine tremor of both hands, elicited best by having the hands outstretched, the fingers spread apart. It was present practically always in the early stage of the disease, and might persist as long as 8 or 10 weeks. To demonstrate this sign more clearly it was advisable for the physician to stretch out his own fingers near those of the patient and compare them, or to intensify the tremor by placing a sheet of paper on the dorsal surface of the outstretched hand. This tremor occurred in other infections but was never so constant or persistent as in poliomyelitis. The disadvantage of this sign was that it could not be used in young infants who were unable to stretch out their hands or in patients who are comatose.

#### A CONTRIBUTION ON POLIOMYELITIS

DR. WALTER LESTER CARR presented this paper. During the epidemic of the summer of 1916 there were received at the City Hospital 63 cases, sent by the Department of Health with the diagnosis of poliomyelitis. The final diagnosis in 5 of these were rickets, enterocolitis, normal child, septic meningitis with multiple abscesses (decompression operation), staphylococcus meningitis, diagnosed at autopsy. Of the remaining 58 cases, 30 were male and 28 female. The youngest child was 3 months, the oldest 9 years; the average age was 3 years. Of the 58 cases, 7 died, 4 within 18 hours, without treatment. Of 54 cases treated intraspinaly, 3 died, a mortality rate of 5.5. There were two instances of more than 1 case in the same family. The most frequent symptoms were irritability, hypersensitiveness and loss of appetite. Constipation was noted in the majority of the cases. The tongue was almost always coated, sometimes tremulous, usually with a yellowish-white coating. Hypertrophied tonsils were noted in 25% of the cases. The superficial lymph nodes were found enlarged in 90% of the cases, but the posterior cervical ones were the most prominent. The enlargement of the lymph nodes was an early symptom. In a few cases there was slight conjunctival congestion; in the cases of cerebral or bulbar type the pupils were less responsive to light than in the lower cord cases. The pulse was frequently recorded

as rapid and thready; this rapidity was not associated with the temperature. A catarrhal condition of the bronchial tubes with râles was observed and recorded, but judging from the cases in the wards there was more than a simple bronchial swelling and secretion, as in 3 cases pneumonia was present. The temperature records were variable, ranging from normal to 106°F. The highest leukocyte count was 40,000 and the lowest 9,000; an average of 18,000. The average polymorphonuclear count was 55%. As a general rule the counts rose after treatment. The urine was always acid and in many cases showed a trace of albumin. In general there was no typical urinary finding. In the series there were 350 spinal punctures made. With few exceptions the spinal fluid was clear, with slightly or markedly increased pressure. The cell counts ranged from 6 to 300, with an average of 36. After intraspinal treatment the cell counts invariably rose, usually above 100. The methods of intraspinal treatment employed were: Bichloride of mercury, grain 1/200 to 1/100 in sterile distilled water, 1 injection in 8 cases without a death. Three did well and in 5 the convalescence was slow; diarsenal, milligrams 2, 1 dose, in 3 cases with no deaths. The results were not deemed satisfactory; adrenal chloride, solution 1/1,000, was used in 16 cases with 1 death. Two cubic centimeters of freshly sterilized solution was given intraspinaly and repeated 2 or 3 times a day as indicated. The indications for the use of adrenalin were respiratory involvement, stuporous and toxic cases, and those having high pressure spinal fluid. The results recorded after the use of adrenalin intraspinaly were: 1—Deeper and less labored respiration. 2—Improvement of the quality of the pulse. 3—Increased blood pressure, usually 10 to 15 points. 4—Pressure of spinal fluid on later punctures became normal. Freshly prepared immune serum was used in 27 cases with 2 deaths. Both fatal cases were in coma on admission. Ten to 15 cubic centimeters was given intraspinaly after allowing 10 to 30 cubic centimeters of spinal fluid to escape. The injection was repeated 2 or 3 times at 24-hour intervals. The conclusion we reached after using adrenalin was that while not a specific its value is unquestioned in all severe and toxic cases and those of fulminating type. The author believes that in all these cases adrenalin solution, 1-1,000 can be administered in doses of 1-3 cubic centimeter every 6 to 10 hours without danger and with more benefit than any other treatment we have at the present

time. On this series, 6 cases showed marked paralysis with very little improvement; 33 very slight weakness of one or more groups of muscles, with daily improvement; 12 cases showed no paralysis. The good results obtained at the City Hospital are in the author's opinion due to the quiet and good nursing the children received and to the use of immune serum and adrenalin. It is not now possible to judge of the statistic of any plan of treatment; it may be that lumbar puncture alone has a therapeutic effect which can be determined only after a careful analysis of many groups of cases.

#### A PATHOGENESIS OF INFANTILE SCURVY—A HYPOTHESIS

DR. H. J. GERSTENBERGER presented this paper, which he summarized as follows:

1—A hypothesis is offered regarding the pathogenesis of infantile scurvy.

2—The hypothesis is divided into four separate parts, of which only the first is considered to be sufficiently based upon experimental and clinical data to permit its exit out of the domain of pure hypothesis.

The second and third, the latter of which has been similarly and previously advanced by other authors, are considered to have as a basis experimental and clinical data that are distinctly suggestive, while the fourth is still purely hypothetical, although upon its assumption it is possible to explain satisfactorily some of the clinical phenomena of scurvy that hitherto have had not even a hypothetical explanation.

3—A report is made of a case of infantile scurvy which showed a marked reduction in the water output of the body through the kidneys without the presence of the usual and known causes for water loss via other channels, and which further showed a marked chance towards a return to normal conditions by the administration of orange juice, indicating a protective salt retention or hindered salt excretion as the cause of the transfer of a good portion of the water excretion from the kidneys to the lungs.

The same condition seemingly was present in 2 additional cases of infantile scurvy, as well as in scorbutic guinea-pig on an oat and water diet.

It is suggested that the phenomenon observed is a part of the regular picture of infantile scurvy and represents an addition to the clinical symptomology of scurvy.

4—A case of infantile scurvy is reported as being a counterpart to Braddon and Cooper's polyneuritic pigeons, but having developed its symptoms on a diet of raw milk, modified, however, by dilution with water to one-half and by the addition of enormous amounts of carbohydrates in the form of Mellin's Food.

5—The experiences of other authors regarding the inefficiency of cod-liver therapy and calcium therapy in scurvy is corroborated by absolutely negative therapeutic results, having been obtained in a case of infantile scurvy upon the administration of tricalcium phosphate and cod-liver oil, indicating that a deficiency of calcium in the diet or in the body plays no primary rôle in the development of scurvy. A report is made of a distinct but temporary improvement in the clinical picture of 2 cases of infantile scurvy upon the administration of large doses of sodium citrate. This observation suggests the possibility of the existence in the development of the clinical picture of infantile scurvy of a *modus operandi* similar to such as has been shown to exist in cell permeability and irritability by the researches of Jacques Loeb.

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UNDESCENDED TESTIS—D. N. Eisendrath (Annals of Surgery, 1916, Vol. LXIV., p. 324) urges that cases of true nondescent or ectopic descent of the testis should be operated upon at as early an age as the condition of the child will permit, the lower limit being about two years. Atrophy of the spermatogenic cells occurs in about 90 per cent. of the cases of retained testis, hence the necessity for early operation. Tumor formation, torsion and the usual complications of the congenital hernia accompanying nondescent of the testis are not as rare as thought to be and must be taken into consideration in weighing the question of an operation. Hypopituitarism is not the result of the nondescent, but an independent and not infrequent accompanying condition. The operation for nondescent, *i.e.*, retained testis, has but little influence upon this lack of development of the male sexual characteristics and one should be guarded in the prognosis for such cases, as well as in the possible development of the testis after operations in young adults.—*American Journal of Obstetrics.*



## BOOK REVIEWS

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A MONOGRAPH ON THE EPIDEMIC OF POLIOMYELITIS (INFANTILE PARALYSIS) IN NEW YORK CITY IN 1916. Based on the official reports of the Bureaus of the Department of Health. Pages 340 with many illustrations and charts. Published under the Direction of the Department of Health of New York City. 1917. Price \$1.50 through Booksellers.

Here is recorded in most careful and elaborate manner the vast amount of work, administrative and medical which was accomplished by the New York City Department of Health under the direction of Commissioner Haven Emerson, in combating the severest epidemic which visited New York and its vicinity during the summer and early fall of 1916. In addition there is much information as to diagnosis, both clinical and laboratory, and to treatment. The epidemiological studies are interesting and carefully worked out. A study of the entomology of the epidemic by Dr. Brues leads one to wish that other articles might have been signed so that responsibility for the opinions expressed might have been placed. Particularly in regard to diagnosis where it is apparently stated that without at least muscular weakness a positive diagnosis of poliomyelitis is not acceptable. Such seems not the attitude of the Department as expressed in other parts of the book and certainly is not that of other workers. So much of interest is contained in this work that the suggestion seems pertinent that a supplementary volume be issued containing an exhaustive index, something which would facilitate greatly the use of the volume.

ACUTE POLIOMYELITIS. BY GEORGE DRAPER, M.D., Associate in Medicine, College of Physicians and Surgeons, Columbia University; Associate Attending Physician, Presbyterian Hospital, New York City. With a Foreword by SIMON FLEXNER. With Nineteen Illustrations. Pages 149. Philadelphia: P. Blakiston's Son & Co., 1012 Walnut Street. 1917.

This very timely monograph supplements to a degree the Monograph of the Rockefeller Institute issued in 1912, of which Dr. Draper was a co-author, in that it brings up to date our information on poliomyelitis. It is, however, more than a mere

catalogue of progress, important as this characteristic is to the physician who desires to acquire a knowledge of this disease which represents the thought of the present day. The book is the expression of the actual experience of an observer who is familiar with all phases of the poliomyelitis problem, laboratory, clinical and epidemiological and in it the problem is interpreted with a breadth of vision and in a manner which cannot be attained by anyone who has not had the long and active contact with poliomyelitis enjoyed by the author. This book may be regarded as representing correctly the present state of our knowledge of poliomyelitis. As Dr. Flexner says in his foreword, "A great need has been felt in the past for an experiential book that is up to date. That need is happily now supplied."

THE TREATMENT OF INFANTILE PARALYSIS. By ROBERT W. LOVETT, M.D., Professor of Orthopedic Surgery, Harvard Medical School; Surgeon to the Children's Hospital, Boston; Chairman of the Harvard Poliomyelitis Commission, etc., etc. Pages 163. With 113 illustrations. Philadelphia: P. Blakiston's Son & Co., 1012 Walnut Street. 1916. (November.)

This book is a brief, yet a comprehensive and authoritative work on the care of poliomyelitis. The influence of Dr. Lovett upon the treatment of this disease and upon the organization of public effort toward the detection and amelioration of the late effects of poliomyelitis has been greater probably than that of any other man. His experience likewise has been very extensive and his methods of treatment are the outcome of careful observation and individual thinking. As presented in this book they have the added merit of a concise presentation and a convenient form. The book is very well illustrated and well worth having if only for the chapters on muscle training and the application of the spring balance muscle test.

# ARCHIVES OF PEDIATRICS

JULY, 1917

ROYAL STORRS HAYNES, PH.B., M.D. }  
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PUBLISHED MONTHLY BY E. B. TREAT & CO., 241-243 WEST 23D STREET, NEW YORK

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## EDITORIAL

### AN OPPORTUNITY FOR PEDIATRISTS AT THE FRONT

There has been little or no opportunity so far in all the preparations for medical war service for the pediatricist to serve where his special training would be of any value. It has been a difficult matter for many to decide just where lay an outlet for their patriotic desire to be of service to the country and the cause. The Council of National Defense has recommended that physicians teaching pediatrics or devoting themselves exclusively to problems of infant and child welfare continue in such service either at home or abroad.

Now there is opening a field which is exclusively pediatric and where there is a clear call for the man whose years of medical training and experience are along the lines of the care of children. The American Red Cross is about to organize infant welfare work in France. From all indications this work is urgently needed not only behind the lines where the German

tide has been rolled back, but throughout all of France. Problems due to underfeeding, shell shock, tuberculosis, alcoholism in children, abortion—all are clamoring to be solved and remedied. Hitherto, during the war, American physicians have not been allowed in civil practice, but have done their work by virtue of military appointment. Now the French Government has amended its practice law and the physicians of the Red Cross will be allowed to practice among the population and to operate such hospitals as may seem necessary.

The War Council of the Red Cross has sent to France to survey the field a commission consisting of Dr. J. Morris Slemons, professor of diseases of women at Yale University, and Dr. William Palmer Lucas, professor of diseases of children at the University of California. They are now on their way to France and expect to return in two months. Their work will be to ascertain what is needed and to make recommendations for the sending over of units. In order that there may be a pediatric unit ready for immediate work if it seems needed, Dr. Julius Parker Sedgwick, professor of diseases of children at the University of Minnesota, has gone over with Dr. Slemons and Lucas as director of such a unit with rank of major. With him as first assistants with rank of captain have gone Drs. Jay I. Durand of Seattle and John Baldwin of Johns Hopkins; and as second assistants with rank of first lieutenant Drs. C. F. Golston, resident of University of California Hospital, and N. O. Pearce, teaching fellow at the University of Minnesota. Already several such units are planned to go over upon the return of Drs. Slemon and Lucas and others will be organized on the same basis to follow later in the year. The directors will go up for six months or more, the assistants for a year at least.

Other units, including a women's unit, will go to Russia, Servia, Roumania, etc., as they can be organized.\*

Here at least is a war work which pediatricists can approach with no feeling that their capabilities do not fit in with the demand. It is our work. As Director Grayson Murphy cabled, "The need is great; the time opportune." The ARCHIVES feels sure that the response will be hearty.

\* Physicians who are qualified to take up the work in any of the three grades may gain information by writing to the American Red Cross, Washington, D. C., directing the letter to "Dr. William P. Lucas, Director of Infant Welfare Work in France," Dr. Lucas' staff having charge of the work during his absence in France.



## ORIGINAL COMMUNICATIONS

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### ACIDOSIS IN INFANCY AND CHILDHOOD

BY ARCHIBALD D. SMITH, B.A., M.D., F.A.C.P.

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**SYNONYMS**—Acidosis, acid intoxication, nondiabetic acidosis. I believe that cyclic or recurrent vomiting should be included under this head.

**DEFINITION**—Acidosis has been defined as an abnormal metabolism of carbon leading to the appearance of organic acids in the blood and urine and the formation of ammonia to neutralize these acids.

**HISTORY**—In the literature Naunyn is credited with being the first to clearly describe acidosis as being the result of the pathologic production of acids in the course of metabolism. Pfaundler and Schlossmann credit Giliberti with the term recurrent vomiting. The earliest reported case of recurrent vomiting was made by Dr. Cureri in 1841. Dr. Gee of London in 1882 contributed the first paper in English on the subject and reported 9 cases. Von Jaksch, in 1883, is said to have been the first to demonstrate the substances of the acetone series in the urine (in diabetic urines).

**ETIOLOGY: PREDISPOSING CAUSES**—*Age*—Of 100 cases, Metcalf gives 3 under 1 year, 8 between 1 and 2 years, and 80 between 2 and 8 years. Howard says that it is about as frequent under 2 years as over that age, and he gives the age of his youngest patient as 4 days.

*Environment*—Of the 100 cases listed by Metcalf 20 were in homes given a fair rating and the remainder from homes rated as good or excellent. This agrees with my own experience, as all of the cases of which I have notes were from homes where the children were not overcrowded, had plenty of air, good clothing, proper food, and whose parents were in comfortable circumstances.

*Frequency*—In 171 consecutive patients, aged 1 day to 12 years, Howard found a definite acidosis in 31 or 18%. In 37

consecutive urines examined by me for acetone, it was found in 5 cases or 13%.

*The Type of Individual*—Many cases occur in children of a nervous type or with a rheumatic, cardiac or choreic tendency. In the type of acidosis occurring at the weaning period the infants are large, robust and have been healthy previously.

*Sex*—Metcalf notes 59 boys and 41 girls in his series. Howard notes 30 males and 34 females in his series. The total of these 2 series would give 89 males and 75 females, showing that the sexes are almost equally liable.

*Exciting Causes*—We are not in a position to say that bacteria act as a definite exciting cause, but the epidemic of 100 cases described by Metcalf must give us pause before we definitely exclude bacteria as a possible exciting cause. We can definitely say, however, that acetone in the urine is found in many acute infections such as tonsillitis, coryza, bronchitis, otitis media and infectious diarrhea. It is also found in intestinal stasis, intestinal intoxication, difficult dentition and following etherization.

*Clinical Varieties*—We meet with 1—Mild cases. 2—Moderate cases. 3—Severe cases; these usually terminate fatally. 4—Repeated attacks. 5—Those cases occurring at the weaning period. 6—Recurrent or cyclic vomiting.

*PATHOGENESIS*—In discussing the pathogenesis of acidosis we must first take up the acetone bodies, acetone, diacetic acid, and beta-oxybutyric acid. These are taken as the representative members because their presence is readily determined.

*What Are These Bodies?*—Acetone, or dimethyl ketone,  $\text{CH}_3\text{-CO-CH}_3$ , is a thin, water-clear liquid, boiling at  $56.3^\circ\text{C}$ . and possessing a pleasant odor like fruit. It is excreted by the urine, expired air and feces. Oxidation of a primary alcohol gives an aldehyde. Oxidation of a secondary alcohol gives a ketone. Secondary propyl alcohol or dimethyl carbinol, on oxidation, gives dimethyl ketone or acetone. The ketones can also take up hydrogen forming the secondary alcohols. They do not yield the corresponding acids but split up into acids containing a smaller number of carbon atoms. Ketones are also produced when the salts of the fatty acids are subjected to dry distillation or when the vapor of the acid is passed through a red-hot tube. In this case acetic acid yields acetone. Acetone is, therefore, the representative of a large class of bodies,

ketones; others of this class can be formed at the same time with acetone, and acetone is taken as the representative because of its ease of detection in the excretions. Because acidosis is accompanied by the production of these ketones, it is sometimes called ketonemia or ketonuria (ketones in the blood or ketones in the urine).

Diacetic acid, aceto-acetic acid, acetyl-acetic acid,  $\text{CH}_3\text{-CO-CH}_2\text{-COOH}$ , is a colorless, strongly acid liquid, mixing with water, alcohol and ether in all proportions. On heating to boiling with water, and especially with acids, it decomposes into carbon dioxid and acetone. It is excreted in the urine.

Beta-oxybutyric acid,  $\text{CH}_3\text{-CH(OH)-CH}_2\text{-COOH}$ , ordinarily forms an odorless syrup, but may also be obtained as crystals. It is readily soluble in water, alcohol and ether. It is excreted in the urine.

*What Is Their Source?*—It was formerly considered that the acetone bodies were produced by increased destruction of protein. One of the various reasons for this was the increase in elimination of acetone and aceto-acetic acid during inanition. Acetone has also been obtained as an oxidation product from gelatin and protein. It has also been shown that the liver is an organ where acetone is formed; also that butyric acid, oxybutyric acid, leucin, tyrosin, aromatic bodies like tyrosin, phenylalanine, phenylalactic acid and homogentisic acid, which contain a combustible benzene nucleus, are transformed in the liver into acetone. Protamines and histones can also increase acetone elimination. As we cannot deny the possibility of the formation of acetone from proteins, still there are observations which are inconsistent with the origin of the acetone bodies entirely from the proteins. Thus, there is no parallel between the acetone bodies and the nitrogen excretion in diabetes and no certain relation between the acetone elimination and nitrogen and sulphur excretion.

The carbohydrates cannot be considered as material for the formation of acetone bodies. In man the exclusion or diminution of carbohydrates from the food may lead to increased elimination of acetone bodies. With abundant supply of carbohydrates the elimination of the acetone bodies may be greatly diminished or stopped entirely.

As the carbohydrates cannot be acetone formers, then only a second source remains, namely, the fats. As proof of this

there are certain cases of diabetes with strong elimination of acetone bodies where the quantity of protein transformed was too small to account for the acetone bodies. Certain investigators have also observed an increase in the acetonuria on partaking of fatty food. For the present the fats are considered as the most important source of the acetone bodies.

Beta-oxybutyric acid is considered the mother substance of acetone and aceto-acetic acid. If beta-oxybutyric acid is introduced into the animal body and the quantity is not too great it is burned, while if in excess it passes into the urine as aceto-acetic acid. This acid can also be burned but if large quantities are introduced it appears in part in the urine and readily splits into acetone and carbon dioxid. Acetone is in part burned in the animal body and a part is eliminated by the kidneys and especially by the lungs. The direction may also be reversed, that is, aceto-acetic acid can also be changed into beta-oxybutyric acid in the animal body, and this has been proved by perfusion of livers in animals.

Since glycerin has an antiketoplastic action, the fatty acids alone must be considered as sources of acetone bodies, and only those normal fatty acids which contain an even number of carbon atoms have been proved to be acetone formers.

*What Are the Theories Connected with the Acetone Bodies?*

The processes by which fat is burned are dependent on the simultaneous combustion of carbohydrates. The acetone bodies are probably excreted as a result of a lessened oxidation of fat brought about either indirectly by lessened sugar combustion or by a direct influence of some unknown nature in fat combustion. This direct influence according to Guthrie is an intoxication produced by absorption of toxins from the intestines by bacterial poisons—for example, pneumonia—or by inorganic poisons—for example, phosphorus. The liver, already laden with fat, becomes surcharged with more fat derived from the subcutaneous tissues. Should the overtaxed liver fail to metabolize the enormous quantity of fat thus brought to it, the circulation becomes flooded with the products of imperfect oxidation.

The acetone bodies constantly appear in some lesions of the pancreas, which fact, too, is in accord with the intestinal origin of some cases of acid intoxication, since disturbance of pancreatic function would reduce digestive activity in duodenum with resulting faulty cleavage of fats.



We also know that acetone is found in small amounts in the urine of healthy children, never exceeding 1 centigram in 24 hours. In increasing amounts it is formed in many pathologic conditions. In these instances, though a state of acidosis exists with the acetone bodies present in the blood, the hydrogen ions are rapidly neutralized by sodium in the tissue fluids, potassium in the cells, and by the alkaline earths chiefly derived from the bones. If this is not enough the excess is neutralized by ammonia derived from the protein, which would normally have been metabolized into urea. There is a consequent increase in the excretion of ammonia, and a diminution in urea. In children it seems to be invariably true that acidosis is accompanied by an increase in the excretion of ammonia. Should more acid be produced than can be neutralized the reaction of the tissue fluids may be altered and cause symptoms of acid intoxications. It is, therefore, very evident that acidosis may be very common, though acid intoxication is rare. It can exist long before the tissue fluids are rendered less alkaline and before toxic symptoms arise. One passes gradually into the other.

Despite the fact that the acetone bodies are only mildly toxic, the general conception is that beta-oxybutyric and diacetic acids by uniting with the fixed alkalis reduce the alkalinity of the tissues and thereby produce a condition of toxemia. The amounts of these 2 acids are in constant relation and with acetone vary directly as the severity of the intoxication. The ammonia excretion is, perhaps, another index of the degree of intoxication, though in pregnancy Ewing found that the estimation of the ammonia nitrogen did not follow this rule.

With the neutralization of the alkalies of the tissues the blood can carry less carbon dioxid; there may be a decrease from normal 24% to 3%; hence carbon dioxid accumulates in the tissues until we have a condition of internal suffocation.

After all, as Ewing says, none of the theories of acid intoxication (carbon dioxid asphyxiation, degeneration of vital organs by withdrawal of alkalies, or even the reduced alkalinity of the tissue itself) has been proved.

**MORBID ANATOMY**—Partial reports of 12 or more necropsies in children are available. In these the predominating lesion was enlargement and fatty infiltration of the liver. In Abt's case the liver was markedly increased in size and presented a light yellowish terra-cotta appearance. On section, the surface was

glistening, had a decidedly yellow color and the knife was greasy. Lobules indistinct. No increase in connective tissue. Fatty degeneration of the parenchymatous cells was extreme and widespread. The little protoplasm that remained was granular. There were many small areas where neither nucleus nor cell body were stained. No normal liver tissue. Many large bacilli not staining with gram. Heart, moderate focal necrosis. Lungs, acute hemorrhagic lobular pneumonia. The liver resembled acute phosphorus poisoning. Kidney, acute granular and fatty degeneration of parenchymatous tissue.

SYMPTOMS—The prodromata are not distinctive and comprise loss of appetite, restlessness and irritability.

The invasion is usually with gastro-intestinal symptoms, vomiting and diarrhea. In 3 instances the invasion was introduced by bronchial asthma, beginning about 12 hours before the symptoms of intoxication. More often coryza or bronchitis preceded the acidosis by 3, 4 or 5 days or even a week. Almost invariably the onset was sudden.

Howard feels that recurrent vomiting without demonstrable cause is sufficiently rare to indicate an extremely careful study of apparent cases for various possible predisposing causes.

The vomiting is repeated many times and is often propulsive in character. Food is vomited first, then the vomited material changes quickly to a watery fluid, then mucus, and is either colorless or yellow. In about 25% of the cases there is a distinct fruity odor to the breath. Tongue is usually heavily coated white or brownish. Thirst is severe. The abdomen is retracted in some of the cases. Constipation is usually obstinate in the severe cases and with this there is marked distention and finally intestinal atony towards the close.

In about 25% of the cases air hunger is present. Cyanosis in a minority of the cases is marked. The pulse is invariably elevated. With high temperature it may go to 160. If the blood is examined it shows the leukocytes to be from 9,000 to 12,000, with a normal differential.

The nervous symptoms vary. Infants may be restless, but in the majority, 64 out of 100 cases, drowsiness is marked. When aroused the child is fretty and irritable. This may pass on to a condition where it is more and more difficult to arouse the child and finally unconsciousness develops. The reflexes are present and normal.

Prostration is marked and the temperature is above 100°F. in the majority of the cases. A temperature of 103°F. and 104°F. is not uncommon. Of 3 fatal cases, 1 had a temperature of 101°F., 1 a temperature of 100°F. and 1 a temperature of 99.8°F.

In the majority of cases there is some evidence of involvement of the respiratory tract, coryza or bronchitis. Respirations are rapid, and in the late stages sighing, and of the Cheyne-Stokes type. Dyspnea is pronounced and all the muscles of respiration are brought into play.

In very many cases the urine is clear and in about 50% is scanty in amount. The reaction is acid. The specific gravity varies between 1,010 and 1,030. In the majority of cases, no albumin is found, though in the minority there is a faint trace. In about 90% of 1 series of cases acetone was found at the first test practically at the beginning of the acute symptoms, which leads to the belief that acidosis of this type is not a sequel of persistent vomiting and starvation. Acetonuria never ceased while the urine was still acid; it tended to persist for several days after the urine became alkaline, especially if the diet were scanty, but in such event the patient showed no toxic symptoms, but if the urine were allowed to revert to former acid condition, toxic symptoms were likely to recur. Acetonuria was of little moment, then, if alkalinity of urine could be procured.

**TESTS FOR ACETONE—Lieben's Test**—The urine is distilled from an ordinary distilling flask into a test-tube until a few cubic centimeters have been obtained. A little Gram's solution is added to the distilled urine and then some sodium hydrate. If acetone is present in large quantity there will be an immediate separation of a yellow precipitate of iodoform. If the quantity is smaller the iodoform is not visible to the naked eye, but the deposit which collects in a short time at the bottom of the test-tube should be examined microscopically for crystals of iodoform. As a rule small quantities may also be recognized by the odor if the test-tube is warmed.

**Legal's Test**—A few drops of a freshly prepared solution of sodium nitroprusside are added to the urine and the whole rendered alkaline with sodium hydrate. A red color which changes on the addition of acetic acid to a carmine and then to a purple red and finally to violet shows the presence of acetone.

**Rothera's Test** (Australian Medical Journal, October, 1910) is said to act in a dilution of 1 to 130,000.

HART'S ACIDOSIS INDEX—1—Test the suspected urine for acetone by means of Lange's test in the following manner: In a test-tube containing 5 c.c. of urine dissolve a few small crystals of sodium nitroprusside, add 1 c.c. glacial acetic acid; overlay this mixture with 3 c.c. of strong ammonium hydroxide. If acetone is present a purple ring will develop at the point of contact between the ammonia and the underlying mixture.

2—If above test shows presence of acetone, make a further quantitative test for diacetic acid. The following solutions are necessary: *a*—The standard solution consisting of ethyl-acetoacetate, 1 c.c.; alcohol, 25 c.c.; and distilled water, 1,000 c.c. *b*—Ferric chloride solution consisting of ferric chloride 100 grams dissolved in 100 c.c. of distilled water. Take 2 test-tubes of equal caliber ( $\frac{1}{2}$  inch in diameter) and put in one 10 c.c. of the standard solution and in the other 10 c.c. of urine to be tested; add to each 1 c.c. of the ferric chloride solution; allow the tubes to stand a couple of minutes to permit the color to develop fully, and then compare the color of the 2 test-tubes when they are held between the sky and the eye. If the tube containing the standard solution is of a lighter shade than the urine mixture, dilute this with distilled water until the colors match, noting the volume to which it has been necessary to dilute the urine mixture. By the use of these reactions we obtain a numerical value for the acidosis index per liter in accordance with the following schedule:

Test 1 positive	} equals acidosis index per liter. 0.5
Test 2 negative	
Test 2 positive	

Volume of urine solution

10 c.c. ....	1.0
15 c.c. ....	1.5
20 c.c. ....	2.0
50 c.c. ....	5.0
100 c.c. ....	10.0

In order to obtain the acidosis index proper we multiply the value of the acidosis index per liter by the amount of urine in liters passed in the 24 hours. For example, a patient passed 3,200 c.c. urine in 24 hours; when 10 c.c. of this was tested, as described before, it was found that it was necessary to dilute



this to 75 c.c. in order to match the standard; his acidosis index per liter was, therefore, 7.5 and his acidosis index was  $7.5 \times 3.2$  equals 24. It is not an exact measure but sufficiently accurate to gauge the variations in acetone body output for clinical purposes.

The acidosis index corresponds approximately in value to the total acidosis estimated in terms of beta-oxybutric acid by the more exact chemical methods, that is, an acidosis index of 10 corresponds approximately to a total acidosis of 10 grams of beta-oxybutyric acid.

COURSE—In the milder and moderate cases after the sudden onset, the symptoms persist for 2 or 3 days and then begin to subside. In the severe cases the drowsiness increases, the child is fretful when aroused, and the drowsiness finally passes into stupor, unconsciousness and death. There are many variations to be met with and the complications add to the variations. The reaction of the urine is the key to the situation, and the sooner the urine is rendered alkaline the quicker the symptoms are controlled.

COMPLICATIONS—Pneumonia occurring late in the course is rather rare but does occur. Otitis media is more common. Acute nephritis developing 10 days after the onset, has been described in 1 case.

DIAGNOSIS—In the mild and moderate cases the only positive diagnostic test is the finding of acetone in the urine. In the severe cases the acetone odor to the breath is quite distinctive and the findings of the urine test are confirmative. In testing the urine for acetone the fresher the specimen the more reliable the test.

PROGNOSIS—It is important to emphasize the early recognition and treatment of acidosis because it is a serious complication. Even if the symptoms accompanying the presence of acetone breath and acetone in the urine are extremely mild, and regardless of whether or not acetone is normally present in the urine in small quantities, or is frequently present in febrile conditions without clinical symptoms, it seems that treatment would be indicated because we do not know how suddenly severe and serious symptoms may develop and early treatment is much more simple and effective. An untreated acidosis, or one that is well developed before treatment is begun, may, in a serious illness, be the real cause of the fatal outcome.

MORTALITY—Metcalf has reported 9 deaths out of 200 cases,

giving 4.5%. Parke has reported 18 cases in infants under 20 months with a mortality of 71%. Howard has reported 3 deaths in 64 cases, giving 4.7%.

It seems, therefore, from the above figures that the younger the child the more serious is the acidosis and the more energetic the treatment should be.

TREATMENT should be directed towards neutralizing the acid intoxication, alleviating its symptoms and removing the predisposing conditions. This consists in keeping the patient in bed and as quiet and free from excitement as possible, the administration of alkalies by mouth or rectum, catharsis, rectal irrigations and diet.

Sodium bicarbonate given by mouth should be well diluted and when so given is retained in the majority of cases. The dilution should be at least 1 in 30, and frequently weaker dilutions up to 1 in 60 are better. If 1 dram is given each hour the urine will become alkaline in 24 to 36 hours. Potassium and sodium citrate are alkalies of second choice. They may be given  $\frac{1}{2}$  to 1 dram every hour in a concentrated solution, 1 ounce of salt to 4 ounces of water. The administration of the alkali should be continued a few days after the subsidence of the acute symptoms.

The combined use of sodium bicarbonate and lactose is considered by some to be more effective than soda alone. My experience leads me to corroborate this view. When used in this way the soda may be given every 2 hours alternating with the lactose solution. This medication is much more effective when given by mouth.

For the prompt and thorough emptying of the intestines 1 grain of calomel in divided doses, followed by milk of magnesia, or citrate of magnesia may be used. In some cases castor oil can be given. A large enema of normal saline or soap suds given as high as possible also helps in emptying the intestines.

Even in the absence of vomiting it seems a rational procedure to stop all food until medication has been given for a few hours. If vomiting is present even liquids, except in extremely small quantities, should be withheld until it stops. A little cracked ice or diluted brandy and cracked ice may be given. When food is commenced a barley-lactose solution is a good stepping stone to more food. After this we begin with a food low in fat such as skimmed milk with or without lime water and

then can add rice water, oatmeal water, orange juice, grape juice, cereals, crackers, toast and broths. Proteids can be used in the form of casein, gelatin, soy-bean flour.

Other medication recommended has been: 1—Subcutaneous or intravenous injections of dextrose or levulose up to 10% in normal saline. 2—Intravenous injections of salt solutions. 3—Stomach lavage. 4—Subcutaneous injection of sodium bicarbonate. 5—Venesection withdrawing 500 c.c. of blood and putting in 500 c.c. normal saline with 10 grams of sodium bicarbonate.

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QUARANTINE PERIOD OF MEASLES—W. B. Whyte (Canadian Practitioner, 1916, Vol. XLI., p. 336) says that all are agreed that the most infective period of measles is the invasion and early eruptive period. As most cases are well into the eruptive stage before seen by the medical profession, any measure decided upon to cope with the situation should be directed toward the control of the movements of contacts rather than to prolonged isolation of the original infecting case. Quarantine and observation of contacts for fourteen days from the date of the last exposure to the original case would seem to be the only effective measure in preventing the spread of infection from house to house. If it were possible to provide a routine examination of patients for Koplik spots during the second week of quarantine many cases could be put under strict isolation during the very period when such a measure is of some value. Prolonged quarantine of the original infecting case probably has no bearing upon the prevention of the spread of infection, but the danger of subsequent cases developing within fourteen days is the more important detail in any effort to control the disease.—*The American Journal of Obstetrics*.

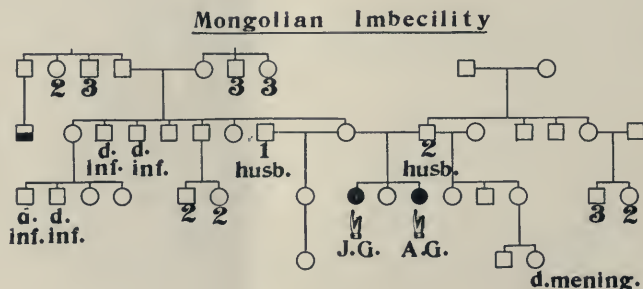
# THE ETIOLOGY OF MONGOLIAN IMBECILITY\*

BY CHARLES HERRMAN, M.D.

New York

The following have been considered by various authors as important factors in the causation of mongolian imbecility:

1—Worry, emotional shock, and disease of the mother during pregnancy. Comby, among others, lays great stress upon worry in the early months of pregnancy as an important factor. However, many mothers give no such history, and a very large number who have had trouble during pregnancy give birth to perfectly normal children. The same may be said of emotional shock and disease. Nature in her desire to preserve and perpetuate the species, protects the germ cell most carefully from all injurious influences, it lives what is sometimes termed “a



charmed existence.” Even in severe disease of the mother, if abortion does not take place, the infant is usually born physically and mentally normal. On Chart 1 I have shown the pedigree of a family which has come under my observation. The mother of the patients J. G. and A. G. was married twice. By her first husband she had one perfectly normal child; by her second, the first child was a mongolian imbecile; the second, perfectly normal, and the third, a mongolian imbecile. The parents were both healthy, the mother was perfectly well during all four pregnancies, she had no worry or shock. It is hardly conceivable that a constitutional disease in the mother

\* Read at the New York Academy of Medicine, Section on Pediatrics, March 8, 1917.



which gave no symptoms, could produce alternately a normal child and a mongolian imbecile. Shuttleworth mentions the case of twins, in which the male was normal, the female a mongolian imbecile. Here again it is difficult to understand how an abnormal condition in the mother could affect only one of the twins.

2—Immaturity or exhaustion of the generative organs especially of the mother. A certain percentage of the mothers of mongols are very young or very old. In about one-third the mother is over 40 years of age. However there remain the two-thirds in which the mothers are between 20 and 40. Large numbers of perfectly normal children are born to mothers over 40, and there is no evidence to show that such children are usually weaker physically and mentally, than those of preceding pregnancies. In about 50% the child affected is the last of a series, but it may be the first child or may be between 2 normal children. Again I refer to Chart 1. Adverse conditions affecting the maternal reproductive organs may possibly act as predisposing, but they cannot be the essential cause of mongolian imbecility.

3—Pressure on the basal ganglia as shown by the short anteroposterior diameter of the skull, the flat occiput, and the diminished weight of the cerebellum, pons, and medulla. Here there is possibly a confusion of cause and effect. An arrest of development of the structures at the base of the brain may be followed by premature osseous union. The primary factor is not the deformity of the skull, but the incomplete development of the brain.

4—Congenital syphilis. Following a suggestion of Sutherland, who found a history suggesting a specific infection in 11 of 25 cases of mongolian imbecility, Stevens in two papers (Journal American Medical Association, 1915, Vol. 64, p. 1636; and 1916, Vol. 66, p. 1373) attempts to prove that this condition is due to congenital syphilis. His reports are based on the investigation of 38 cases, in which he found the Wassermann reaction in the blood serum positive in 21.5%, and in the spinal fluid in 18% of the cases. A large number of authors have investigated the frequency with which the Wassermann reaction is positive in mental defectives, and their results vary considerably. Gordon (Lancet, 1913, Vol. II., p. 861) in a series of 400 cases found it positive in 16.5%. The average of 12 authors, representing a total of 3,872 cases of mental defective-

ness was 9.1%. Eight of Gordon's cases were mongolian imbeciles and all gave a negative Wassermann reaction. His conclusions are that with the exception of hydrocephalus and the plegic forms of mental defect, syphilis is as likely to cause simple, uncomplicated congenital mental defect as any particular type; and that mongolian imbecility is not commonly caused by congenital syphilis. Holt (*American Journal Diseases of Children*, 1913, Vol. VI., p. 166) in 8 cases of mongolian imbecility found the Wassermann reaction negative in all. In 48 additional patients with other congenital anomalies the reaction was also negative. This is significant in view of the fact that mongolian imbecility is often associated with other congenital anomalies. I have tested the blood of 6 mothers of mongolian imbeciles and found the Wassermann reaction negative in all. I did not consider it necessary to test a larger number, because if only 1 in 7 or more was positive, the percentage would be no larger than the average found in all forms of mental defects, and would not show that syphilis stood in a special relation. Clinically also, no definite relation to syphilis has been shown to exist. Shuttleworth found evidence in only 4 of 350 cases, Still, 1 in 18 cases, Muir, 3 in 26 cases, Hjorth, in not a single instance in 21 cases. Frank cases of congenital syphilis are common, but I do not remember having seen a single case which presented the manifestations of mongolian imbecility. The depressed bridge of the nose, the nasal obstruction and the open mouth, occasionally make the differential diagnosis difficult (Van der Bogert, *American Journal Diseases of Children*, 1916, Vol. XI., p. 55). On the other hand, during the last 18 years I have had over 100 cases of mongolian imbecility under observation, and I do not recall a patient that presented unmistakable manifestations of congenital syphilis. Even if we grant that in a few the disease was latent, we should expect some to show distinct lesions. In those families in which there is a syphilitic infection, the first children usually present marked manifestations, and the severity of the symptoms tends to diminish with each pregnancy. In mongolian imbecility it is frequently the last child, and the last child only, which is affected. Several of Stevens' patients presented manifestations which I have not observed in my own cases, namely, corneal opacities and spastic paraplegia. On the contrary a peculiar laxity of the extremities is characteristic of the majority of

cases. Stevens' conclusions are: "While the serologic tests seem to demonstrate beyond question that this condition is a result of syphilitic infection, it is not, however, to be considered a form of Frank cerebrospinal syphilis. The characteristic facies of the Mongolian syndrome and the dwarfing of the body make it appear probable that the syphilis acts primarily on some of the endocrine organs, possibly the pituitary body." Even 21.5% positive Wassermann reaction in the blood serum, and 18% positive in the spinal fluid, hardly justify the conclusion that "the serologic tests seem to demonstrate beyond question that this condition is a result of syphilitic infection." A characteristic facies may occur independent of an involvement of the endocrine organs. It is true that disturbances of the pituitary body may cause changes in the bones of the skull and face, but not all such changes are necessarily due to lesions of that organ. The dwarfing in mongolian imbecility is usually not marked, and is not to be compared with that in congenital absence of the thyroid gland. In some of my patients it was not as great as that associated with conditions which are quite independent of primary disturbances of the ductless glands, such as congenital heart disease and the intestinal infantilism of Herter. Distinct manifestations of disturbed function of the endocrine organs are not present in mongolian imbeciles, and postmortem examinations (Bourneville, Comby, Fromm, Bernheim-Karrer, Lange) have not shown any characteristic changes in the thyroid, thymus or suprarenal bodies. The administration of extracts of these glands in mongolian imbeciles has not been followed by marked improvement. There is one feature upon which I believe more emphasis should be placed, namely the frequent association of mongolian imbecility with other congenital anomalies. Besides the more common ones, congenital heart disease, strabismus and anomalies of the palate, ears, fingers and toes, I have also had two cases with congenital cataract under my observation. There are comparatively few of these patients who do not show some anomaly. Many of these deformities are known to be inheritable according to the Mendelian laws, many others are probably transmitted in this way. Congenital anomalies though anatomically distinct, are embryologically related. Is it not plausible that the association of these anomalies with mongolian imbecility in the same individual is not merely a coincidence, but that the peculiarities of the brain, skull and face are dependent on sim-

ilar causes, and that they are also inheritable according to Mendelian principles? Before discussing this possibility, a brief outline of the Mendelian theory will not be out of place. Reduced to its simplest form, the essential features are: 1—The existence of dominant and recessive unit characters. 2—The segregation of unit characters. In the mating of a pure

### Mongolian Imbecility

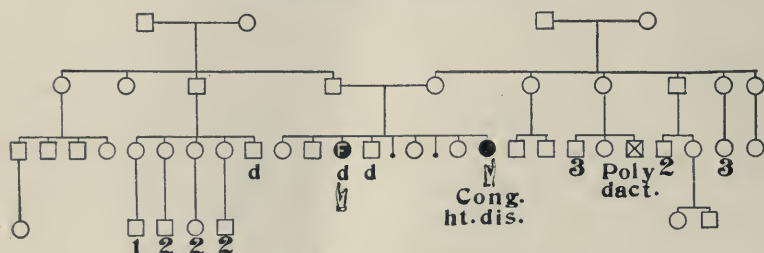


CHART 2

black guinea pig with a pure white one, the offspring will be all black; black color being dominant over white, the character which declares itself was called by Mendel the dominant character, and the other which recedes from view for the time being, recessive. In the case of a recessive unit character only a very small percentage of the individuals of a family may show

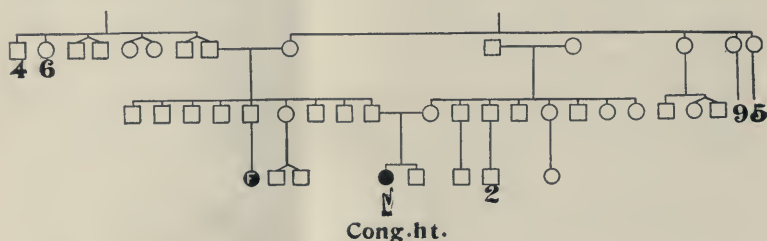


CHART 3

the characteristic. In the offspring of a pure black guinea pig and a white one, the animal though black, has received from the parents, both the factor for producing white and the factor for producing black offspring. But in any single germ cell of the animal, the factor for producing white or that for producing black exists alone, never the two together. Some germ cells contain the black factor and some the white factor, but no cell con-

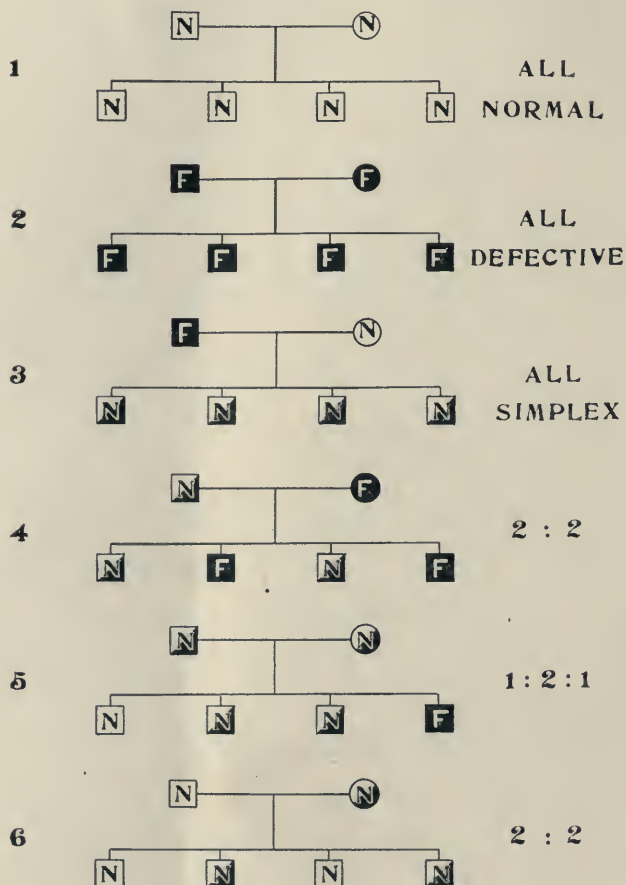


tains them both. This is segregation. A carrier may be defined as an individual who has within him the peculiarity or unit character in a concealed, latent, or recessive form, so that although apparently normal, he may transmit this characteristic to his offspring. He is not unlike the "carrier" in the communicable diseases, who although free from the disease himself, may transmit it to others.

In Chart 4 the Mendelian theory as applied to feeble-mindedness by Goddard is shown in graphic form. The truth of the result of matings as shown in 1 has been fully demonstrated. The correctness of the result of mating as represented in 2 has been shown by 482 offspring of feeble-minded parents, all of whom, with the exception of 6, were feeble-minded. Even these few exceptions are doubtful when we consider the possibility of errors in judgment in the case of individuals of subnormal intelligence and the possibility of illegitimate births. The results of matings as given in 3 to 6 when large numbers of offspring have been considered, have been shown to be remarkably accurate. With only 4 offspring the relative number of normals, carriers, and feeble-minded may not be exactly as shown, with 8 it is more likely to be, and with 12 still more likely. From this chart it will be seen why a feeble-minded child only results when a carrier mates with either a feeble-minded individual or an individual carrying the same unit character as himself. In 5 we see why there is greater danger in the mating of cousins, if there is a defect in the ancestry, because having grandparents in common, there is more likelihood that they are both carriers, though they may appear perfectly normal.

Although Goddard considers normal intelligence a unit character and dominant, and apparently feeble-mindedness a unit character and recessive, he does not include mongolian imbecility in the hereditary form, which follows the Mendelian formula, but concludes that "the sole and adequate cause of mongolian imbecility is to be sought in the condition of the mother during pregnancy." He admits, however, that no one knows what causes the abnormal condition in the mother. It has already been shown in Chart 1, and in the case of the twins recorded by Shuttleworth how unlikely it is that the condition of the mother is responsible. Goddard's unwillingness to include mongolian imbecility in the hereditary forms of feeble-minded-

# THE MENDELIAN THEORY



Six possible matings of parents  
with the possible offspring

Assumption—Feeble mindedness is recessive unit character

ness is apparently due to the fact that in most of the cases the family history is good.\* All observers have pointed out the difficulty of getting complete and accurate pedigrees. In Chart 5 I have reproduced 2 pedigree charts of families with poly-

### POLYDACTYLISM

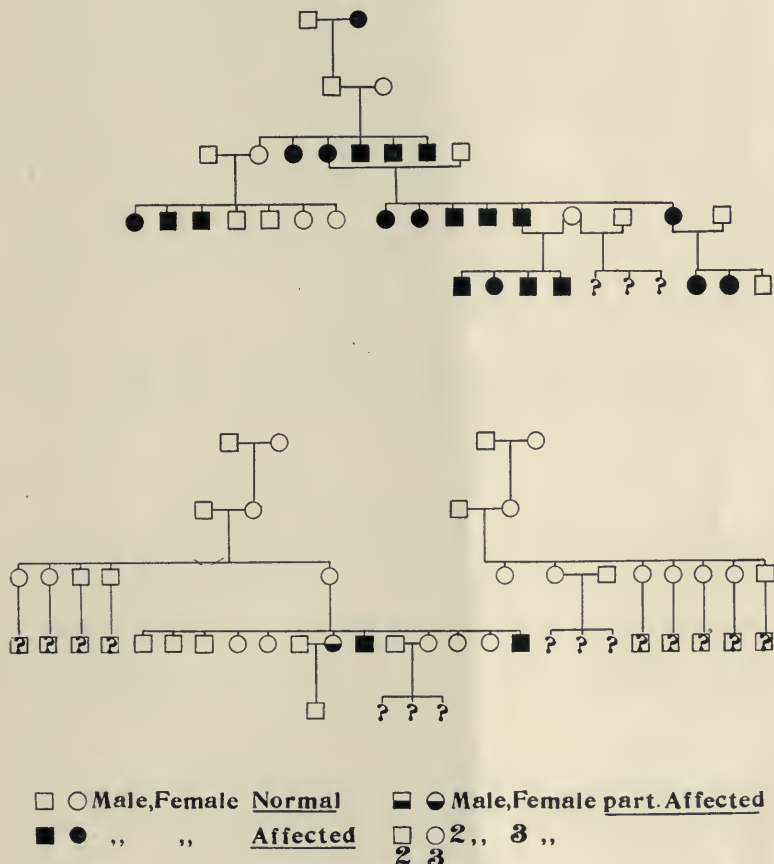


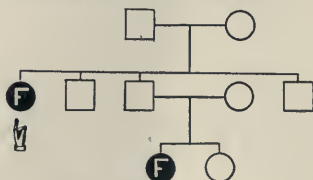
CHART 5

\* Goddard mentions that in going through the classes for exceptional children in the public schools of New York City, he found on the average 1 case of mongolian imbecility in each such special class on the West Side, and a few or none on the East. This he considers as an indication that the condition occurs in families with a good pedigree. This does not agree with my own observations. My patients have been seen chiefly among the poor, many from the East Side. Many of these children die in infancy and early childhood. Such deaths may possibly occur more frequently among the poor who are not able to give as much care and attention. Very few survive until school age. Among the poor the majority of these are placed in institutions, because the parents cannot take proper care of them at home, whereas among the well-to-do this can easily be done.

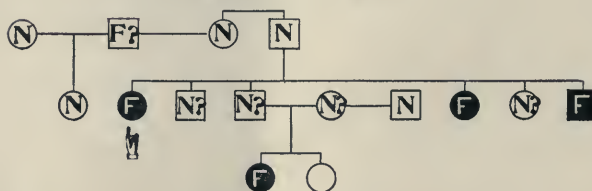
dactylism. The first is that reported by Smith and Norwell (British Medical Journal, 1894, Vol. II., p. 8), the second by Struthers (Edinburgh New Philadelphia Journal, 1863, Vol.

### Mongolian Imbecility

#### Original pedigree



#### Revised pedigree



[N] [N] Male, Female Normal    [Nf] [Nf] Male, Female prob. Normal  
 [F] [F] .. .. Affected    [Ff] [Ff] .. .. Affected

CHART 6

XXVIII., p. 83). This is an anomaly which would hardly escape notice even in an infant which lived only a few days, and there would be no reason for concealing the fact that such a deformity occurred, and still the 2 charts show the greatest difference in demonstrating that polydactylism is an inherited unit character. In Chart 6 I have reproduced 2 charts of Goddard's, the first the original, the second the revised form. It will be immediately seen how much more complete the second is, and how erroneous conclusions would be that were based on the data as originally obtained. It must be remembered that abortions, miscarriages, stillbirths, and deaths in early infancy, frequently occur in the family histories of mongolian imbeciles, so that it is not at all unlikely that such a case is occasionally overlooked or unrecognized. I have often been told by the



mothers of these patients that the physician who examined the patient in early infancy considered that the inability to sit alone was due to rickets or general weakness, and expressed the opinion that the child would grow up normally. In the 300 feeble-minded investigated by Goddard, 65% are classed as hereditary or probably hereditary, while only 11 or 3.6% were mongolian imbeciles. These relative percentages correspond well with those given by other authors, so that hereditary feeble-mindedness as classified by Goddard is about 18 times as common as mongolian imbecility. It is therefore not surprising that the pedigree charts of mongolian imbeciles should not indicate inheritance so frequently or so distinctly. The probability of mating of 2 carriers of this unit is much less than of 2 individuals who are carriers of simple feeble-mindedness. It must be remembered also that one positive pedigree is more convincing and valuable than several negative ones. In 1 of Goddard's families (Chart 6), and in 3 families which have come under my own observation (Charts 1 and 7 and one uncharted) there were 2 mongolian imbeciles. Shuttleworth, Stevens, Hjorth (twins) have also reported such cases.

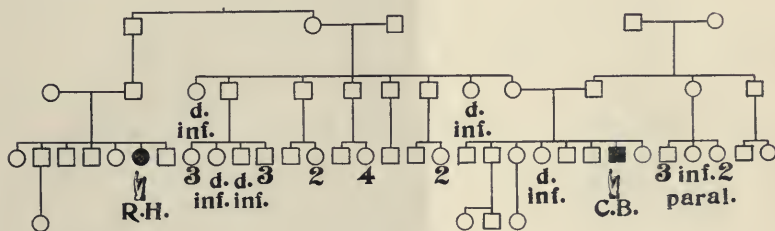


CHART 7

CONCLUSIONS—There is no positive evidence that worry, emotional shock, illness during pregnancy or congenital syphilis are important or essential factors in the causation of mongolian imbecility. The evidence that mongolian imbecility is a unit character and recessive, although not conclusive, is certainly suggestive.

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# ACUTE ILEOCOLITIS IN INFANCY \*

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Every year thousands of cases of infectious diarrhea occur among the children of the world with a seriously high mortality. According to Still nearly 4,000 children die in London each year from this cause. Out of this vast number can be taken a large group of the more serious cases, which, from special symptoms and fairly typical anatomical findings, can be classed as ileocolitis. Because of the difficulty of drawing a line between gastro-enteritis and ileocolitis, many writers rather prefer to deal with the conditions together. However, the severity of the anatomical changes, the seriousness of the symptoms, the special prophylactic measures and the great difference in the treatment, make a special grouping quite necessary.

## ANALYSIS OF THE CASES WITH BLOODY STOOLS

No.	Age	Number of Stools	Blood	Duration of Case	Outcome of Case	Temp. °F	Pulse
1	3 years	6	+	5 days	Death	103	120
2	2 months	5	+	19 days	Death	103	123
3	20 months	15	+	11 days	Recovered	101	120
4	6 months	4	+	7 days	Death	106	
5	14 months	2	+	7 days	Death	103	
6	5 months	4	+	10 days	Death	99	
7	5 weeks	4	Micros.	14 days	Recovered	101	120
10	4 months	4	Micros.	15 days	Recovered	99.5	116
16	3 months	6	Micros.	26 days	Recovered	100	138
20	10 months	5	+	16 days	Unknown	99	
24	4 months	7	+	27 days	Recovered	100	128
25	2 years	7	++	8 days	Recovered	103.2	122
26	6 months	4	+++	25 days	Death	104	150
33	20 months	8	+++	9 days	Death	102	140
34	4½ years	8	+	11 days	Recovered	100.2	98
37	16 months	11	+	6 days	Unknown	99.3	128
41	4 years	8	++	15 days	Recovered	103	92
42	5 months	20	++++	6 days	Death	104	124
44	5½ years	5	+	14 days	Recovered	102	84
47	8 months	12	++	12 days	Recovered	102	130
48	4 years	7	++	12 days	Unknown	102.8	152
49	19 months	3	++++	10 days	Recovered	99.8	94
50	9 years	5	+++	23 days	Recovered	101	90
51	15 months	5	+++	7 days	Death	104	130
52	6 weeks	5	+	5 days	Death	102.4	140
53	8½ months	5	+++	1 month	Recovered	100	120
54	2½ years	9	+++	14 days	Recovered	103	132
55	9 months	4	+++	20 days	Recovered	101	110

\* Read before the Rochester Pathological Society, February 23, 1917.

The series of cases that we are to study are taken from the records of the Infants' Summer Hospital, the Children's Hospital and the writer's practice. There are 54 cases in all which, from the symptoms and the diagnosis recorded on the chart, can quite properly be classed as ileocolitis. The analysis of the records was made in order to arrive at a better method of diagnosis, to secure more accurate signs for prognosis, and to determine the most successful method of treatment.

The typical case of ileocolitis is most likely to occur during the summer months in bottle-fed babies under 2 years of age, the characteristic symptoms being acute, onset with moderate fever, vomiting and diarrhea. The stools are numerous, small, green and offensive. After a day or two they are likely to contain much mucus and a varying amount of bright-red blood.

ETIOLOGY—Holt and Flexner decided that ileocolitis was caused by the dysentery bacillus of Flexner and allied bacilli, and that the true dysentery bacillus of Shiga was very uncommon. The colon bacillus and the streptococcus also probably play important parts. Kerley says that a large percentage of those cases with blood and mucus in the stools is caused by the dysentery bacillus.

Of this series, 27 of the 54 cases were under 6 months of age, 8 between 6 and 12 months and 12 between 1 and 2 years, and all occurred in the summer or early fall. Few gave a history of any previous diseases.

PREVIOUS FOOD—There were but 4 breast-fed children in the series and 9 fed on modified milk. Fourteen had been fed on condensed milk formulas previous to admission and several on barley-water mixtures of little or no food value for a considerable length of time. It is quite the usual thing to find that there have been many changes in the methods of feeding and so all other foods can be included. Insanitary home conditions, poverty, and general carelessness in food preparation acted as etiological factors.

The infectious character of the disease is best shown by giving the histories of 4 family groups of this series.

GROUP I.—CASE 29—Age 23 months. Admitted July 13, 1915, with a history of 4 weeks' standing diarrhea and a previous history of diarrhea in February. There were a few loose stools that were green and offensive. The temperature was below 99.2°F.; pulse, 98. The child made an uneventful recovery.

CASE 15—Age 5 months. Admitted August 11, 1915, from the same family with a diarrhea of 5 days' duration and 1 month's previous history of convulsions of unknown cause. He was having 6 liquid green stools daily, moderate vomiting and was very toxic. Temperature, 102.6°F. He died in a few hours.

CASE 17—Age 5 months. Twin sister of the last case. Admitted the next day. This child had had diarrhea for 1 day and was passing 5 liquid green stools daily, was vomiting and very toxic. Temperature, 100°F. Pulse, 118. Death occurred in 2 days.

The infection had been present in this family for several months and continued reinfections ended in the death of the 2 youngest children. They had moderately bad stools with no blood and but one had mucus (the type that might be classed as severe gastro-enteritis).

GROUP II.—CASE 6—Age 5 months. Admitted after his twin brother died of gastro-intestinal trouble. The physician was called when both children were moribund from the disease, following a long continued barley-water diet. This case gave a history of 7 days' duration, greenish yellow stools with moderate blood and mucus. Temperature, 101°F. Pulse, 90. The child died in less than 2 days.

GROUP III.—CASE 50—Age 9 years. Girl. Admitted to the series to show the source of infection. Had diarrhea 7 days, bloody stools 3 days. Was passing 5 stools daily with very marked blood, mucus and pus. Also had vomiting. Temperature, 101°F. Pulse, 90. She made a good recovery after 23 days' illness.

CASE 51—Brother of the last case. Admitted 1 month later, or very soon after his sister had returned home. He had been sick 4 days, had 5 foul stools daily containing a large amount of blood, mucus and pus. He was very toxic and vomited severely. Temperature, 104°F. Pulse, 130. He died 3 days later.

GROUP IV.—CASE 54—Age 2½ years. Boy. Sick 4 days, 5 liquid, greenish stools with a large amount of blood and mucus. Was very toxic but had no vomiting. Temperature, 103°F. He made a good recovery.

CASE 55—Age 9 months. Sister of the last case. She was taken sick a few days after the boy was sent to the hospital. Had



‡ liquid, greenish, foul stools, with a large amount of blood and mucus. No vomiting and was not toxic. She was not severely ill but turned out to be a very obstinate case, as did her brother. Good recovery with no further trouble.

Cautley and Escherich also report groups of this kind. These cases bring before us the danger of transmitting the disease by close contact. In care of such cases this should be kept in mind and the parents warned of the danger.

**PATHOLOGY**—There are several varieties of ileocolitis and their frequency can best be shown by giving the autopsy findings in 82 cases reported by Holt.

Follicular ulceration .....	36
Catarrhal inflammation .....	26
Catarrhal inflammation with superficial ulceration..	6
Membranous inflammation .....	14

Our autopsies demonstrated the typical lesions, but the most important point was that the lesions of ileocolitis were found in cases that had shown such comparatively mild symptoms.

**SYMPTOMS**—The sudden onset and progression is well demonstrated by our cases, just one-half of which had been sick 4 days or less when admitted. The great number of stools of which many have spoken was not found. The stools were mostly green, liquid and offensive, and all except 11 contained mucus. Blood was found in 28 cases (3 microscopical). There were 10 cases without blood or mucus. Six cases had pus in the movements and in 3 gas bacillus was found. Vomiting was a common symptom, being present in 30 cases. It became very marked in one-fifth of the series. The severe vomiting and diarrhea, drawing the water from the tissues, quickly gives us the pinched face, sunken eyes and depressed fontanelles. The progression is usually rapid and prostration occurs early. One-half of our cases showed toxemia and one-third were very toxic. Convulsions were not common, appearing in but 4 cases. Prolapsus ani, mentioned as a symptom by all authors, was not seen in this series. The temperature varied a great deal, but it is interesting to note that in 29 cases it never ran over 101°F. The pulse was surprisingly slow for such young infants, few being over 150 and more with a pulse of about 130. The physical examination gave practically nothing of value, the signs being the same as those found in a case of malnutrition. The abdomen was normal in over one-half the cases, in some it was retracted,

others distended and in a few slightly tender. The liver was palpable in a large per cent. The average illness was 15 days, the cases that recovered having an average of 18 days. This gives an idea of the common symptoms of the disease, the seriousness of the various symptoms will be considered later.

DIAGNOSIS—The greatest problem in diagnosis is to distinguish between gastro-enteritis and ileocolitis and to determine, if possible, the type of colitis present. Cautley says, "Follicular ileocolitis must be suspected in cases of infectious diarrhea in infants in whom the fever has persisted for over a week and whose stools contain much blood and no mucus." In later stages, when ulceration has occurred, blood may be present in small quantities.

The anatomical findings of ileocolitis were found in 2 of our cases that had each shown a little blood but once and in 1 other case that had never passed bloody stools although he had been sick for over 6 days. This shows that some cases must be diagnosed as ileocolitis before the typical blood and mucus are present. It must be remembered that some physicians make a diagnosis of ileocolitis on milder symptoms than those required by others, and that others will not make such a diagnosis until bloody stools are present. There are several cases in this series without the typical stools, but they were left in because they had been so diagnosed by the physicians in charge and also to offset the cases omitted by those requiring the extreme symptoms before making a diagnosis. Our cases had less temperature, a slower pulse and were more toxic than most cases of gastro-enteritis which shows a high temperature and a fast pulse from the start.

Ileocolitis must be diagnosed from typhoid fever, intussusception and meningitis. With typhoid, the higher temperature, the longer duration of illness, Widal reaction and blood culture make the problem a fairly easy one. Intussusception with the palpable mass and partial or complete obstruction with the very rapid onset and progression can be determined if we are on the outlook for the condition. Meningitis can be ruled out by a spinal puncture if the nervous symptoms are at all suggestive of that disease.

PROGNOSIS—Many interesting points regarding prognosis were brought out by a study of the charts.

Age—Of the 27 children under 6 months of age, 13, or practically one-half, died, while the total mortality for the series was 33½%. The younger the child the worse the prognosis.

*Weight*—The prognosis is more serious in the thin and the undernourished. All children lose during the attack and in this series they regained weight very slowly during convalescence.

*Duration of the Disease*—The records show that, although many of the 23 children brought in early were very ill, they had the same mortality as the rest of the group.

*Previous Food*—Those fed on condensed milk have a bad prognosis, 8 out of 14 having died. It is rather surprising that 2 out of the 4 breast-fed babies died.

*Stools*—Only 1 fatal case showed over 10 stools in 24 hours, which demonstrates that the number of stools is a poor prognostic guide. Mucus was found in the stools of all but 1 fatal case. Ten that recovered had no mucus. The more mucus the worse the prognosis. Blood in the stools is a bad sign, 10 of our fatal cases having this symptom. The amount of blood need not be great to be serious because only 3 fatal cases had 2 plus blood in the movements, while in the series 11 cases had 2 plus blood. Five cases showing a large amount of bright red blood in the stools recovered. Children under 6 months of age with bloody movements have a very poor chance, children over 2 years have a much brighter outlook. Pus in the stools is a bad sign.

*Vomiting*—Severe vomiting is a serious sign at any age, 8 out of 11 with marked vomiting died.

*Toxemia*—Naturally this gives a very bad prognosis; of 13 cases with 3 plus toxemia but 3 recovered.

*Convulsions* are very serious; every case died.

*Temperature*—The higher the temperature the less the chances are for recovery. A low temperature is a good sign; only 4 out of 29 with a temperature of 101°F., or less, died.

*Pulse*—This is a very poor guide except toward the end of life, when it becomes weak and irregular. A slow pulse may mislead the examiner.

*Abdomen*—The condition of the abdomen cannot be used as a guide; 11 of 18 fatal cases had a negative abdomen.

**SUMMARY OF PROGNOSIS**—We can draw from the above that a child under 6 months of age who is poorly nourished and has been fed on condensed milk has very little chance for recovery if his temperature is over 102°F., if he is vomiting, and has 8 liquid, green stools with much mucus and a little blood daily, even if the pulse is slow and the abdomen show nothing. He has no chance if he is having convulsions.

The duration averaged 15 days, those recovering were sick about 3 weeks and those who died averaged 9 days. If the child survives the first week his chances for recovery are much better. Morse of Boston says that they are not out of danger until they are well, and that the chances are about 3 out of 5 for recovery. Koplik gives the mortality between 30% and 40%. Our mortality was 33 $\frac{1}{3}$ %. Cautley of England says that no case is hopeless.

**PROPHYLACTIC TREATMENT**—This series has demonstrated the danger of infection and also that the convalescing child may infect others, especially younger children. This makes prophylactic measures of greatest importance. Strict asepsis must be observed; the children should be isolated if possible, and the nurses instructed as to washing their hands after contamination. Everything about the child should be sterilized, remembering the danger of bottles, nipples, napkins and thermometers.

We have also noticed the danger of long-standing gastrointestinal disease. This emphasizes the importance, especially in summer, of clearing up each digestive disturbance thoroughly, removing the causative factor if possible. Any suspicious milk or other food should be avoided. Convalescent children should be kept away from all small babies. Condensed milk is a dangerous food in the hands of the uninstructed parents and should be used with great care.

**ACTIVE TREATMENT**—When a diagnosis of ileocolitis has been made, the child should be isolated and put in a quiet room with a good nurse in attendance. There should be no visitors and no loud conversation in the room. It is important to omit all unnecessary handling and examinations. The child should be seen several times daily by the physician for the first 2 or 3 days because many of these patients sink rapidly and need to be watched more closely than the average case. If the diarrhea has been present for a short time 1 or 2 drams of castor oil should be given. If the child is vomiting, calomel in  $\frac{1}{10}$  grain doses up to 1-grain may be given. If the diarrhea has been present for a week or more it is sometimes advisable to omit the initial cathartic. It is also advisable to question the parents closely to ascertain if a cathartic has been given and thus save unnecessary and harmful medication.

**DIET**—It is best to omit all milk from the diet for a few days. As a substitute give cereal waters with or without sugar. Sugar should be omitted if the stools are of a frothy character.



Barley-water is used by many but rejected by a few. Still is very much in favor of rice water. Kerley sometimes uses Eiweissmilch, 1 part milk to 4 parts water. Albumen water and beef juice may cause decomposition, especially the beef juice. Fresh weak tea has considerable value as a substitute for milk. The returning to a milk diet should be done gradually and carefully, first adding sugar, later skimmed milk and then whole milk. One of the commonest faults is to give too large feedings. Very small amounts should be used frequently, especially if there is vomiting.

DRUGS—Bismuth subnitrate in 10-grain doses may be of value. Precipitated sulphur, 1 grain, is of value according to Kerley. Salol is of some value. Dover powder or paregoric is also used. Some claim that small doses of castor oil, 4 minims under 2 months and 5 minims in children over 2 months will help to control the diarrhea.

*Stimulating and Supportive Measures*—Old brandy 10 to 30 drops may be given to a child 1 year of age, according to Holt. Hot applications to the abdomen and hot mustard baths are frequently used. Caffein sodium benzoate or salicylate are used by some. Subcutaneous injections, hypodermoclysis, of normal saline or sodium bicarbonate solution replace the loss of fluids. A new method that bids fair to become popular is the injection of fluid into the longitudinal sinus.

Serums are of little value and bulgaricus bacillus cultures can not be depended on in very many cases although I have thought that some cases were benefited by these cultures.

LOCAL TREATMENT consists of high rectal irrigations given through a No. 25 French catheter. Large quantities, a gallon or more, may be used if a free return flow is allowed. The bag should be held 2 feet above the bed and normal saline or a 1% sodium bicarbonate solution employed. Usually too many irrigations are given, 1 or 2 a day are enough and they should be stopped if there is an increase in the number of stools. The after care consists of careful supervision of the diet, observation of the stools and frequent records of the temperature. Any return of the symptoms requires prompt treatment. A change of climate is of great value.

880 Monroe Avenue.

### THREE UNUSUAL CASES OF CONGENITAL ORIGIN

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Very often authorities are prone to criticise physicians for reporting individual cases of interest, but in commenting upon the same, they fail to take cognizance of the fact that it is this particular type of case that is likely to be undiagnosed. It has been our routine at all times to examine in detail every case brought to our knowledge and the diagnoses have been made by deduction alone. This has been fruitful of good results. The cases herein reported are ones which he has diagnosed as a result of this mode of procedure.

#### CONGENITAL ABSENCE OF CONDYLES OF THE FEMUR (LUES)

—CASE 1—John M., age 1½ months, was seen first in consultation by Drs. Stone and Rocquet on March 8, 1916. Almost since birth the parents noted that the child was unable to use the right lower extremity, and it seemed impossible for the child to flex his leg on his thigh.

*Family History*—Youngest of 2 children, the older seemingly in good health. Father and mother deny venereal and hereditary stigmata. Tuberculosis, malignancy, rheumatism and insanity are negative.

*Birth History*—Born at full term, normal delivery, weight 7 pounds. An old expression of the face was especially noticeable. Other than this there was nothing of significance to note.

*Feeding History*—Breast fed every 2 hours during the day and twice during the night. There was a tendency toward constipation.

*Physical Examination*—The baby seemingly was well nourished and normally developed. The expression was that of an old man. The body was covered with an abnormal quantity of hair. The wig while not typical was suggestive. There was a general enlargement of the liver and the superficial glands. The two most probable diagnoses in this case seemed to lay between

the so-called Parrot's Pseudoparalysis and some congenital deformity. As it is unusual for the distal ends of the long bones to be attacked by the *treponema pallida* the question of tuberculosis as the third possibility was suggested. In actual measurements the right extremity was almost one inch shorter than the



FIG. 1. CASE 1, showing congenital absence of condyles of right femur



FIG. 2. CASE 1, showing normal condyles of right femur in same case after treatment

left. This was not the type of paralysis associated with the Parrot's deformity. The difficulty entailed by this child was the inability to use the leg in flexion and a slight inward rotation of the leg and extension of the foot. An X-Ray was made by Dr. Ernest Samuel and a diagnosis was at once evident—a congenital absence of the condyles of the right femur, with the evidences of congenital lues described above. Feeling that perhaps this might have been the etiological factor in this particular case Dr. Bloom began at once to give mixed treatment. In addition to this Dr. Stone used extension for almost a month beginning with 1 pound and finishing with 3 pounds. On May 31 the second X-Ray was made and fortunately our diagnosis was correct, the condyles now assuming their normal size for a child of

this age. Figs. 1 and 2 will clearly show the effect accomplished in this most unique case. Since, in conversation with a relative, also a physician, we learned definitely that there was a history of this infection in the family on the father's side. The child otherwise seems well and at this time both limbs measure



FIG. 3. CASE 2, showing congenital absence of coccyx

the same. The child is being rubbed with an inunction of mercury, and is receiving 10 drops of a saturated solution of potassium iodid 3 times daily.

CONGENITAL ABSENCE OF COCCYX AND CONGENITAL BACKWARD DEVIATION AND SHORTENING OF COCCYX.—CASES 2 AND 3. Geneva and Hazel P., sisters, ages 9 and 5 years respectively, were first seen by Dr. Bloom on August 26, 1915; the former complained of a lump at the bottom of her spine, and the latter was annoyed by a constant pressure being felt at the tip of the spine when she reclined. Relative to the birth, family and past history there is nothing which might give color to these unusual cases. Their physical and mental status were above the average. Physical findings in the former revealed a black and blue mark at the end of the canal, the edges of the last vertebrae being pointed and the absence of the coccyx being obvious. The examination of the second child exhibited an inward rotation of the coccyx and sacrum with shortening. Dr. Bloom is indebted to Dr. Henriques for the plates that are displayed in this paper.



and while a tentative diagnosis was made in the former the latter was only diagnosed by X-Rays.

With regard to the literature of the cases herein reported the authors have been unable to obtain but little data concerning them. While a few authorities may report minor abnormalities,



FIG. 4. CASE 3, showing inward rotation of coccyx and sacrum with shortening

it is his impression that the first two cases are most infrequent; therefore, similar cases have either been undiagnosed by some or have not been reported by others.

Bruch,<sup>1</sup> Castor,<sup>2</sup> Desfosses,<sup>3</sup> Fere,<sup>4</sup> Macdonald,<sup>5</sup> Stein,<sup>6</sup> Froelich,<sup>7</sup> Mercier,<sup>8</sup> have reported cases bearing somewhat on this subject. Other than this the writer was unable to find any definite record of a congenital absence of the condyle of the femur.

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## HEAT AND INFANT MORTALITY.

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Infant mortality compared to the general mortality rate has always been strikingly high. Recent statistics for thirty-one leading countries covering a period of 25 years show a death rate for infants of 154 per 1,000. It is estimated that it is now running about 130 per 1,000, which is about the figure for the United States. This means that the death rate among infants is about ten times as high as for the total population.

Two points relative to high infant mortality are noted: First, the increase comes mainly in the summer quarter, July, August and September. Second, the great cause is gastro-intestinal disorders.

Since the development of bacteriology in the last quarter of a century there has been much work done on all known diseases from the standpoint of their bacterial origin. Before that period heat was universally accorded first place in the etiology of infant mortality. In our time there has been a tendency to forget the heat factor, and reduce all causes to the bacterial standard. In the last few years, the problem of temperature has been considered anew, mainly by the Germans, and now seems about to be elevated to the prominence from which it was displaced by the intensity of bacterial study.

Liefmann and Lindermann<sup>1</sup> have investigated the relation of heat and infant mortality in Berlin covering a period of 15 years. Schereschewsky<sup>2</sup> in an excellent review of the subject calls their work "the most careful study of this nature in recent literature." Zohorsky<sup>3</sup> and Helmholtz<sup>4</sup> have made similar observations for the United States. American literature on the subject is scant.

Infant metabolism is on a higher plane than adult metabolism. It requires about 70 calories per kilo weight for growth and something like 30 calories more for heat and waste; or 100 calories per kilo. This is about twice the caloric requirements of an average man at work. McClure and Sauer<sup>5</sup> have found the skin temperature of the infant to be 3°F. to 4°F. higher than that of the adult. Therefore, any interference with heat conduction and radiation would show its effect more quickly in the

infant. As is well known, external heat will cause an actual rise of body temperature in the infant, an observation made many times both experimentally and accidentally, e.g., Wolff<sup>6</sup>. That is, the infant's heat regulating apparatus does not respond with the same efficiency as in the adult. It becomes all the more necessary, therefore, to regulate room temperature and clothing for the infant. McClure and Sauer<sup>5</sup> have shown that with light hospital clothing consisting of cotton gown, double-breasted cotton undervest, cotton hose and diaper, 32% of heat radiation is intercepted at room temperature of 76°F., while at 87.8°F., 76% of heat radiation was intercepted; that is, at a temperature of 87.8°F., with light cotton apparel, the point is approached where heat loss by conduction and radiation is no longer possible. At this point heat elimination can take place only by the evaporation of moisture. Room temperature and infant clothing would seem, therefore, to demand our first thought in dealing with both the sick and well child. Excessive heat depresses the anabolic processes, increases metabolism, prevents the normal gain in weight, decreases appetite and gastric and intestinal secretions. It is experimentally shown also that heat diminishes the resistance of the organism to intestinal bacteria.

It is not surprising, therefore, that, under modern housing conditions and the overclothing practiced by the ignorant mother to prevent catching cold, the mortality curve mounts high with the heat of summer.

There are two distinct elements in the curve of infant mortality: Early summer mortality and late summer mortality.

During the months of May and June there occur short periods of excessive heat in which the mortality suddenly rises with the sudden rise of temperature and drops as suddenly with it. Later, in July, August and September, there come prolonged heat periods with a broad high curve of infant deaths.

These two periods differ in two respects. First, in early summer the death rate rises abruptly and falls with the temperature, but, in the late summer short remissions of heat do not affect the death rate; on the contrary it continues high, falling gradually in the autumn, and does not reach the normal until sometime after the fall of temperature. One reason for this prolongation of the mortality curve beyond the temperature curve is shown to be due to *indoor* temperature. After the prolonged heat of summer the room heat does not fall with lowering

outside temperature, but remains greatly in excess of it for days and even weeks. Helmholtz,<sup>4</sup> in the stockyard district of Chicago, recorded an indoor reading thirty degrees in excess of the outside. In only 30 out of 1,374 readings did he record an indoor temperature below 80°F. Second, the difference between early and late summer heat is in the character of the attending deaths. In the early summer the causes are due to heat stroke, convulsions and acute symptoms not gastro-intestinal. With a less efficient heat regulation, as before mentioned, the infant would theoretically be in still greater danger from heat stroke than the adult. Bleyer<sup>7</sup> believes that heat stroke is not well known or diagnosed. It may occur at 71°F.-72°F. The symptoms are high fever, thready pulse, loss of consciousness, convulsions and death. He thinks this group more important than generally admitted. It is small compared to the next group.

Late summer brings the broad high curve of infant deaths due to intestinal diseases. In the registration area of the United States in 1912 there were 42,482 deaths from intestinal disorders under 2 years of age, 56% of which were in July, August and September. February gave about 1,500; August six times as many, or 9,000. During this period children die from the rapidly fatal course of cholera infantum or more frequently from the prolonged illnesses of subacute and chronic diarrhea. As Schereschewsky says: "The mortality curve in this portion of the summer seems to express the summation of the effects of a long period of warm weather as a basis."

The element of food as a cause of deaths from summer diarrhea must also be thought of at this point. Thiemich,<sup>8</sup> Keller<sup>9</sup> and others show that milk decomposed by saprophites is practically harmless if fed to infants in cold weather or in summer if the environment and care is good. It is also a fact that infants fed on practically sterile products such as condensed milk, fare much worse with respect to diarrhea than those fed on cow's milk of the right strength. A certain proportion of summer morbidity and mortality is due to specific intestinal infection, but the commonest causes are: Poor heat elimination, high external heat and excessive food.

Our duty to the baby is to begin with proper adjustment of room temperature, clothing and food. The tendency of the average solicitous mother is to overclothe and overfeed her baby. Sauer<sup>10</sup> has found very little difference in the amount of indoor



clothing worn by young tenement babies during hot and cold weather.

The real factors that demand the attention of the physician in combating summer morbidity and mortality of infants are: (1) Decrease heat production by giving less food, more suitable food and more water. (2) Increase heat elimination by scant, permeable clothing, better ventilation and frequent baths. (3) Guard against infection through food and otherwise. It may all be summed up in: Educate the mother.

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Dr. Francis Duffield of Detroit reports to the ARCHIVES OF PEDIATRICS a case of mumps in a boy 6 years old, which is quite rare. This boy's family history is negative and his personal history is good. About 2 weeks before he was taken sick his sister developed a swollen submaxillary gland which persisted for about a week. There was a little temperature the first day. Then the boy developed a one-sided enlargement of the parotid gland involving the submaxillary. Temperature was about 101°F. He had all the symptoms of mumps. Toward the end of the second day there was a marked enlargement of the thymus gland. The enlargement was oval in shape with a diameter of about 3 inches. There was no tenderness and no other symptoms. The writer has looked through the literature and can find no record of anything similar to this except one small paragraph in Pfaundler and Schlossmann mentioning the fact that the thymus is rarely involved. The other parotid gland became involved soon after; then all the glands subsided and the boy made an uneventful recovery. There had never been the slightest suspicion of thymus enlargement before this. The swelling has absolutely disappeared and the boy is perfectly normal.

## SOCIETY REPORTS

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### NEW YORK ACADEMY OF MEDICINE

#### SECTION ON PEDIATRICS

*Stated Meeting, Held April 12, 1917*

THE PRESIDENT, ROGER H. DENNETT, M.D., IN THE CHAIR

#### SINUSITIS IN CHILDREN

DR. K. A. PHELPS stated that sinusitis in children was barely mentioned or not mentioned at all in the standard works on pediatrics, rhinology or pathology. Even books devoted exclusively to diseases of the nasal accessory sinuses gave little or no space to sinusitis in children. One reason for this was that the condition was frequently unrecognized by the pediatricist, the rhinologist and the pathologist. Regarding the frequency of this condition in children authorities differed, some stating that it occurred as often in children as in adults, while others maintained that it almost never occurred in children.

At Johns Hopkins Hospital and Dispensary during the last 4 years, 200 children presenting some definite sign or symptom of a sinus infection were carefully examined, including the X-Ray examination, and in only 33 of these was sinus infection definitely proved. The records of the Manhattan Eye, Ear and Throat Hospital for the past 5 years showed but 12 cases of proved sinusitis in children. There were, however, records of undoubted sinusitis in children which were not included, because the infection was not definitely proved either at operation or at postmortem. It would, therefore, seem that sinusitis was not a common disease in children; it was nevertheless a most important one.

From a study of about 300 X-Rays, together with the actual dissection of children's sinuses, it might be stated that the sinuses were probably more variable than any other structure in the body. Their size, shape, development, or even presence, was never the same in 2 individuals, and even in the same person the sides were likely to be asymmetrical. The ethmoid and maxillary sinuses were present from birth and were clinically important from that time; the sphenoids and frontals were clini-

cally important from the ages of 3 to 6 years. Some of the 35 cases referred to above gave interesting histories regarding the etiology. One followed going in bathing, 4 followed definite coryzas, 6 followed infectious diseases (scarlet fever, measles (2), typhoid, pneumonia and influenza); 4 came on suddenly over night, 1 followed a tonsillectomy and 1 followed extraction of a tooth. In a study of 37 cases reported in the literature in which the etiology was mentioned, in all but 5 it was scarlet fever. Grove reported a series of cases in which infection was due to postoperative vomiting following adenoidectomy. There were few reports of investigations having been made in a group of children with any infectious disease to determine the presence of sinusitis. It would be most instructive to study a group of children during some epidemic, especially of meningitis or poliomyelitis. Perhaps some valuable information regarding the portal of entry in these diseases could be obtained. Co-operation between pediatricists and rhinologists along this line would accomplish something.

Once a sinus was infected, anything causing obstruction to its drainage would determine the further course of the disease. In children, nasal obstruction was most often caused by adenoids, and in certain cases of sinus infection not demanding radical operation an adenectomy would often give relief. Sinusitis might occur at any age; the youngest case coming under our observation was 5 months old. Acute sinusitis was said to be more frequent in children than the chronic form. Still, if children were systematically examined for a sinus infection, a chronic infection might be more often found.

Of the 35 cases, 19 were acute, and nearly all presented some complications. Two had meningitis on admission to the hospital, 3 had orbital abscesses, 2 had orbital cellulitis with no pus found at operation or postmortem, 5 had swelling of the eyelids, 1 had an abscess of the lower lid, 1 had swelling between the eyebrows, 1 had a cheek abscess and 2 suffered from acute otitis media, which cleared up on treatment of the sinusitis, 2 gave evidence of profuse nasal discharge, and 1 complained of severe headache and nasal obstruction.

Often acute cases went undiagnosed for they might clear up spontaneously, death might occur and no autopsy be done, or the complication might be treated as an abscess of the eye, without ever knowing that a sinus infection caused it. Chronic

sinusitis was, perhaps, of more interest than the acute form. In adults it was an established fact that the sinus might act as a focus of infection, producing general symptoms and the same relation might hold good in children. If every child who suffered from meningitis, asthma, nephritis, arthritis, endocarditis or headaches, in whom the etiology was obscure, as well as those suffering from long standing coryzas, frequent tonsillitis, bronchitis or laryngitis, were carefully examined for a sinus infection the relation above mentioned might frequently be established. The author had seen children with bronchitis, asthma and nephritis and acute otitis media markedly improved by operation on the infected sinus. In few chronic cases could the history of an acute stage be obtained. Usually the onset was gradual and the symptoms indefinite. The diagnosis was only made after the most careful and painstaking examination and study. The most common symptoms complained of were nasal discharge, headaches and nasal obstruction. In treating sinusitis in children the same general principles applied as in adults. Non-operative measures often produced good results. Twenty-one of the 23 cases were seen at least 1 year after treatment was completed; 13 showed no evidence of active sinusitis; the remaining 8 were all improved.

DR. LEWIS A. COFFIN exhibited specimens showing the anatomical structure of the various sinuses in young children. He also showed lantern slides illustrating the development of the sinuses at different ages, and the comparative appearance of normal and diseased sinuses as shown by the X-Ray, at the same time giving an informal talk on the diagnosis and treatment of sinusitis in children.

#### ABSTRACT OF DISCUSSION ON SINUSITIS IN CHILDREN

DR. DUNCAN MACPHERSON said the paucity of the literature on this subject had been mentioned. Dr. Coffin had made a great part of the contribution to the literature of sinusitis in children that we have to-day, and he was in a position to give us accurate information as to the anatomy and development of the sinuses in children.

In the matter of making a diagnosis we had found that there were many possibilities of making mistakes. The X-Ray will probably give us much help but radiographs have been



found very deceptive. Dr. Coffin had shown us X-Rays in which there were marked contrasts and the evidence of health or disease very clear, but even in adults there were instances in which occasionally the X-Ray was very misleading. In cases in which the X-Ray had indicated the presence of disease he had found on operating a perfectly healthy sinus; on the other hand there have been cases in which there was evidence of sinus disease in which the X-Ray gave no indication of its presence. He emphasized that depending on making the diagnosis from the X-Ray alone was very great. It was not the easy thing to tell whether the pus was coming from individual anterior or posterior cells that the picture might have led you to believe. Frequently it was necessary to make 2 or 3 examinations and to employ suction before one was able to get pus and be positive that he was dealing with sinus disease.

The diagnosis of sinus disease was of considerable importance in view of the fact that so much had been said with reference to focal infection and no doubt an infected sinus might furnish a focus of infection. In children the symptoms were entirely objective and, therefore, it was very much more difficult to tell whether disease was present. Even adults might be swallowing secretions from a diseased sinus without noticing it until they had been put in a healthy condition and then they admitted that they had been swallowing it. Children were of course unable to give any information of value and one had to draw his conclusions from observation. Frequently the examination of a child's nose was very difficult. One could not tell much from the nasopharynx as there might be small adenoids and it might not appear abnormal if there were a small amount of secretion. If looking under the inferior or middle turbinated one found after 2 or 3 examinations a layer of mucus it might be an indication of a possible sinus condition. A few years ago we were accustomed in such cases to clip a little piece off the inferior border of the inferior turbinated or else one applied astringents. Now these patients were treated by suction, but a mild suction by means of a catheter continued with light general suction which removed the secretions from the mucous membrane and the nasal cavities. This applied to cases of acute rhinitis and coryza where on careful examination one found pus.

The mother or nurse should give careful attention to the amount of mucus that was secreted by a child under the age of

3 to 5 years, as such observation was of considerable value. In adults the question one asked was, "How often do you blow your nose or how many handkerchiefs do you use in a day?" Anybody using more than one handkerchief a day was considered as having an abnormal amount of secretion and probably there was something wrong with some of the sinuses.

Another point that was important was the relationship of sinus disease to otitis media. They had found a certain number of cases of recurring otitis media which had cleared up on treatment of a sinus infection. Where one found repeated acute exacerbations of middle ear trouble it was well to remember that they might be the result of a "dirty" nose, and frequently there was behind it a sinus condition. This rendered the child susceptible to acute rhinitis and middle ear diseases, and predisposed to exacerbations. Dr. Coffin had appointed out that by careful observation it was possible to tell from which cells the discharge was coming, though this was not as easy as it might appear from his statements. It might be repeated that the ethmoids were present from birth and a child might have ethmoid disease at birth. The frontal sinuses only made their appearance at about the first to the third year. The maxillary sinuses were present at birth as a small slip; they look smaller because the mucous membrane was relatively thicker.

One point with reference to washing out this sinus. The method described had been to go in as high under the inferior turbinated as possible and to direct the needle upward. In the child or adult this was dangerous because of the possibility of going through the orbit. The way to avoid this was to turn the needle downward, reversing the direction, but introducing the needle as high under the inferior turbinate as it could be placed.

In cases of so-called orbital abscess it might not be possible to find pus in the orbit. In many instances one was not dealing with an orbital abscess but with a cellulitis. The pus was in the sinus and one could get it out by treating the sinus without making an incision through the eyelid, because the trouble had its origin in the sinus.

DR. SEYMOUR OPPENHEIMER said he had been interested in Dr. Coffin's presentation because he had made some investigations along these lines. He had made a series of sections of the skulls of children and had noticed that the sinuses developed earlier than had been considered to be the case. There was no question

as to the frequency of these conditions in children, notwithstanding the fact that many had made the statement that sinus disease was rare in children. He had reported on a study of 120 cases of acute suppurative middle-ear disease from which he had concluded that if proper examination were made a certain number of these cases would show the presence of a suppurative process in the sinuses. The mucous membrane lining the eustachian tube was a continuation of that lining the nose and throat. After a study of the surgical anatomy of the parts one was not surprised to find orbital complications in the presence of sinus disease. The speaker had seen cases of orbital disease as the result of sinus disease and 2 cases of basilar meningitis as the result of infection of the sphenoid cavity. If one remembered the relationship of the sphenoid to the base of the skull it was easy to see how this might occur.

Another cause of sinusitis in children, not mentioned in the paper, was the vaginal discharge of the mother at the time of the birth of the child.

As to the relationship of sinus disease in the adult to pre-existing disease of a similar nature in the child there could be no doubt. If one went back through the histories of these patients, one found evidences of sinus disease extending back into early childhood. Purulent rhinitis was undoubtedly due to infection of the accessory nasal sinuses.

As to the question of diagnosis, this was not as simple as Dr. Coffin stated. It was not an easy matter to state whether the discharge was coming from the superior meatus or the middle meatus. It was by no means as simple a matter as would appear from the bristles inserted in the specimen in the picture.

Nothing had been said of the use of the nasopharyngoscope. One thing had appeared as very significant to him and that was the amount of lymphoid tissue. One was likely to find it larger on one side than on the other when there was accessory sinus disease. A unilateral hypertrophy along the faucial fold was suggestive of underlying sinusitis.

In closing, Dr. Oppenheimer suggested that a little more attention be given to children with snuffles and a mucopurulent discharge during the diseases of childhood; a large proportion of these cleared up without surgical interference but there might be a latent process that would give rise to disturbance in later years.

DR. L. T. LE WALD said Dr. Coffin had brought out the point as to the frequency of maxillary sinus disease in children and Dr. Oppenheimer had emphasized this fact. From many postmortems on children Dr. Le Wald had been struck by the frequency of sinus complications. He said he wished to emphasize the frequency of these conditions encountered in making X-Ray examinations. The difficulty of getting evidence of ethmoid disease by means of the X-Ray had been spoken of. The Caldwell position gave a better angle for the ethmoid and frontal sinuses than the so-called Baltimore position.

#### GOITER IN CHILDREN

DR. EDWARD W. PETERSON said that goiter in childhood was of frequent occurrence in goiter districts abroad and was by no means uncommon in certain districts in this country. Scattered throughout the literature were numerous reports of both the sporadic and the endemic types. It manifests in a general way the same clinical and pathological varieties as seen in the adult, and the same imperfectly understood causative factors were believed to be concerned in its production. Goiter might occur congenitally; it occurred more often in the male than in the female. Demme in Switzerland collected 642 cases of which 53 were congenital. Goiter of the new born was often nothing more than a tumefaction of the thyroid gland which disappears spontaneously in a few weeks. Less often there was a persistent tumorous enlargement which gradually increased in size. Ninety per cent. of the cases of congenital goiter, if the goiter persist, showed evidence of hypothyreosis or develop cretinism.

Claude White (*Journal of Obstetrics and Gynecology of the British Empire*) reported the case of "Fetus with Congenital Hereditary Exophthalmic Goiter." It was the only example of the kind that the writer had been able to find in the literature. Dr. Peterson had 2 cases which he briefly reported. The first patient came under his observation on January 18, 1905, when she was 5 weeks old. At that time she was admitted to the babies' ward of the Post-Graduate Hospital. Her parents were Hungarians. The family history was negative. Labor was easy and the infant was normal at the time of birth except for a relatively large tumor on the right side of the neck. There was some difficulty in breathing for the first 2 hours after birth, after which there was neither dysphagia nor dyspnea. The growth



lay on the right side of the neck behind and to the inner side of the sternomastoid muscle, extending from the level of the jaw downward nearly to the clavicle. The tumor was made up of 2 masses, the larger situated above. It was smooth on the surface, of firm consistency and did not fluctuate at any point. Below and to the side there was distinct palpable nodulation. An incision was made parallel to the right sternocleidomastoid muscle. A fibrous capsule which surrounded the growth was opened and the tumor was dissected without difficulty. Several times during the operation artificial respiration had to be resorted to. The wound was closed without drainage. For 24 hours after the operation the infant had to be prodded occasionally as breathing would stop. At such times artificial respiration was employed. Shortly after the operation the temperature rose to 105°F. and then gradually declined. Nine days after the operation a convulsion occurred. After this, convulsions became more frequent and severe. When the pathologist's report was received stating that the specimen was a congenital thyroid tumor, it was believed that the entire thyroid gland had been removed and thyroid extract was started at once. This was followed by a cessation of the tetany. At this time palpation of the neck showed no evidence of any remaining thyroid. The thyroid feeding was kept up for the first 4 years of the patient's life and then discontinued. A close watch had been kept for any evidence of hypothyroidism, but the patient's subsequent development, both mental and physical, had been normal. The following is the report of the pathologist, Dr. Sondern: "Macroscopically the tumor is horseshoe in shape, one side being composed of a large elongated tumor mass measuring 6 centimeters x 4 centimeters x 3 centimeters. The other side was composed of a tumor measuring 4 x 2½ x 2 centimeters. These 2 tumors were joined at the concavity of the horseshoe by a band of fibrous tissue. Both of the tumor masses had a slight irregular lobulated appearance. Microscopically sections taken from both tumors showed the same structure, which was that of the thyroid gland. The acini had undergone a slight adenomatous proliferation. The diagnosis was adenoma and colloid degeneration of the thyroid gland." The questions which this case brought up were: Was all the thyroid tissue removed at the operation? Why did tetany develop? Would the child continue to develop normally?

The second case was that of a boy of 10 years who was operated on July 6, 1916. The operation presented no peculiar difficulties. The patient had been greatly improved by the operation. The mass removed weighed 65 grams, according to the report of the pathologist. It gave the typical picture of thyroid adenoma. The pathologist believed it impossible to say whether the growth was or was not malignant at the time of its removal, but stated that it certainly presented characteristics suggestive of such tendency and in all probability if not completely removed would recur locally.

The following points were of interest in connection with goiter in childhood: Colloid goiters were exceedingly rare in childhood. A localized swelling or encapsulated adenomatous growth of the lower pole of the right lobe were the types most frequently encountered. The right lobe was involved 10 times as often as the left. Juvenile goiter affected males almost as often as females. Graves' or Basedow's disease was rare in childhood. The writer, however, had encountered 2 typical cases, a girl of 9 years and another of 12. Seibert believed that the trouble yields more readily to treatment in children than in adults.

Inflammatory swelling of the thyroid was met with in the course of acute infectious diseases, but suppurative thyroiditis was almost unheard of in pediatric practice. However, within a period of 6 months the writer had had 2 cases of thyroid abscess in their Babies' Ward Service. It was exceptional to find a child with a goiter who was perfectly normal mentally and physically. Influences which tended to increase the thyroid circulation, such as prolonged physical and mental strain, depressing emotional excitement, puberty, pregnancy, etc., favored the further growth of the goiter once it was started.

The treatment of simple goiter is palliative and operative. Palliative treatment includes systematic rest, drugs, laxatives, intestinal antiseptics, specific thyroid medication, and X-Ray and radium therapy. Early cases of diffuse goiter were amenable to appropriate medical treatment.

The indications for operation were as follows: 1—All simple goiters which did not respond to medical treatment. 2—Nodular goiters. 3—Goiters producing pressure symptoms. 4—Abnormally situated goiters, especially those which project into the thorax. 5—Goiters developing suddenly and growing

rapidly. 6—Painful or sensitive goiters. Operation was contra-indicated when serious cardiac, pulmonary or renal disease existed. The most useful and the most frequently applicable operation was the method of excision as practiced by Kocher. Enucleation could be recommended in selected cases for the removal of single encapsulated growths or cysts. Resection was indicated in large diffuse goiters, when, for curative as well as cosmetic reasons, the removal of one lobe was not sufficient. In nodular goiter involving both lobes of the gland, excision of one lobe with enucleation of the growth in the other lobe, was the method generally employed. Exenteration was practiced in inflamed or deeply seated or inaccessible growths, where complete removal was unwise or impossible. Ligation of the thyroid arteries alone was rarely ever done in cases of simple goiter as the more radical operation could usually be carried out. Under no circumstances should the whole thyroid gland be removed. Every effort should be made to preserve the parathyroids. The removal of too much or of all of the gland would be followed by myxedema, and if the parathyroids were removed at the same time tetany and death will ensue.

#### A CASE OF EXOPHTHALMIC GOITER

DR. SARA WELT-KAKELS presented this patient, a boy 14 years of age, who gave a history of emotional shock. Dr. Welt-Kakels stated that exophthalmic goiter was a condition which was rare in boys and also rare in children under 14 years of age. It had been stated that only 5% of the cases under 16 years of age showed the characteristic symptoms, tachycardia, exophthalmos, etc. This patient showed all these characteristic symptoms, including Graef's symptom; that was, the upper eyelid did not follow promptly and evenly the movement of the finger downward, but halted and moved jerkily. This boy also showed a defect in convergence. His tonsils were irregular and enlarged. He had tremor of the fingers. The tachycardia ranged from 92 to 120. The action of the heart was normal, though there was a change in the sound over the right apex and also over the thymus. The blood pressure was 135 to 140. It was claimed that high blood pressure was found not only in hyperthyroidism, but also in hypersecretion of the adrenals and that cases of adrenal involvement usually showed the higher blood pressure. In this case the Wassermann was negative. The blood examina-

tion showed hemoglobin 58%; red blood cells 3,300,000, leucocytes 14,000. This was not the characteristic blood picture in exophthalmic goiter as there was a leucocytosis whereas one would have expected a lymphocytosis.

AN EXPERIMENTAL AND CLINICAL STUDY OF THE ISOLATED  
THYROID HORMONE

DR. NELSON W. JANNEY made this communication in which he reviewed an investigation of the hormone isolated by Dr. E. C. Kendall of the Mayo Clinic. He stated that this preparation presented unusual difficulties in its isolation and purification. In the pure state it was crystalline, had a constant melting point, and consisted of 66% iodine. The therapeutic effect of the hormone was controlled by metabolic studies made on animals and thyroid patients. The nitrogen balance, as explained in a previous communication (*Medical Record*, 1917, Vol. XCI., p. 352), was found useful in following the effect of this new thyroid remedy.

These studies had now been extended to a series of normal control cases, exophthalmic goiter and cretin patients. Normal individuals reacted with tachycardia and other toxic symptoms with very small amounts of the thyroid hormone, usually 1 to 2 milligrams daily being sufficient to cause this reaction if continued for some time. The nitrogen balance began to decrease before clinical symptoms appeared. Metabolism was evidently profoundly affected by the hormone. Small doses varying from 0.01 to 0.1 milligrams daily were administered to various exophthalmic goiter patients. Improvement of the clinical symptoms followed in some cases and an increased retention of nitrogen was observed. In the majority of the cases, however, the clinical condition and the nitrogen balance remained stationary so that, as would on a priori grounds be expected, no definite therapeutic effect in exophthalmic goiter was observed.

Prolonged studies were carried out on a cretin who remained on fixed weighed diets and daily determination of the nitrogen intake and output, for a period of some 30 weeks. It was found that decided clinical improvement followed the daily administration of a hormone solution containing 0.25 milligrams of iodine. Marked retention of nitrogen occurred on this dose and went hand in hand with the clinical improvement.

The great activity of this preparation might be judged from



the fact that 0.5 milligrams daily was found by their metabolic methods of investigation to represent an overdose. That the nitrogen retention was due to the effect of the thyroid preparation was proved by administering fresh thyroid gland and thyroid tablets to the same patient, both of which caused nitrogen retention likewise.

From this work the conclusion might be drawn that the thyroid hormone as isolated by Dr. Kendall probably possessed all the therapeutic action hitherto ascribed to thyroid preparations. It was likely that owing to its fixed constitution and the delicacy thus to be obtained in the dosage, that this hormone would be preferred to other thyroid preparations when its production attained commercial proportions.

DR. JOHN ROGERS said that to review this subject in brief one must begin with the pathology which was quite different in simple goiter from that of exophthalmic goiter. It was also important to recognize the distinction between localized and diffuse goiter, especially in children. The diffuse symmetrical enlargement of the thyroid seemed to represent a hypertrophy which was compensatory to some unusual demands upon the gland, or to ordinary demands upon a gland that had not the normal strength. This kind of goiter needed no operation, but did need supportive treatment in the form of good hygiene and generally one or another kind of thyroid feeding, which was supposed to help out a feeble organ.

The localized cysts or adenomata of the thyroid seemed to represent a disease which might or might not arise from some obstruction to the outlet of the thyroid secretion. At any rate the localized tumors apparently pressed upon the rest of the gland and interfered with its function, predisposing it to further degenerative changes and, therefore, should be excised. This was true when the constitutional condition represented either hypo- or hyperthyroid activity.

Exophthalmic goiter was not very uncommon in children as proved by the case shown here to-night, and was, in the speaker's experience, an exceedingly serious disturbance. It always required surgical interference. If the enlargement and disease of the thyroid was confined to a single portion of the gland, this portion should be excised and the superior and generally the inferior thyroid vessels ligated. When the gland was symmetrically diseased, especially in these youthful cases, his

experience with excision had been disastrous. He advised all cases of exophthalmic goiter, when the gland was diffusely involved, that all 4 thyroid vessels be tied in 2 or more sittings, and one or another kind of organ therapy, generally an adrenal extract, be subsequently instituted. He should pursue this course in the case presented here this evening.

Dr. Rogers stated that he had recently observed some experiments in animals which seemed to confirm the theory that the thyroid gland had much to do with the production of energy. It was possible to isolate and attach to a writing lever one of the voluntary muscles of a cat. This muscle when stimulated electrically, would continue to contract without much evidence of fatigue for 4 or 5 hours. If the thyroid gland, however, was previously extirpated, fatigue of the muscle under the same stimulation would take place within 15 or 20 minutes. An injection of thyroid extract, such as they were making at the Loomis Laboratory, would then cause the muscle to contract vigorously and without fatigue for several hours. Hence it seemed probable that the thyroid had a great deal to do with the production of muscular energy, and there was good reason for enforcing the rest which was so necessary in the treatment of these cases.

As to the so-called active principle of the thyroid with which Dr. Janney had been experimenting, one should be a little cautious in accepting the results of its clinical exhibition. Almost any material isolated from the thyroid gland was capable of producing more or less marked clinical results. If the active principle was ever found, it must be determined with far greater accuracy than was possible by clinical observations.

In conclusion Dr. Rogers suggested that children were far more frequently the subjects of hypo- or hyper disturbance than was generally realized, and especially were they subject to hypothyroidism. In cases of hyperthyroidism in children he urged conservative rather than radical interference, as it was possible by damage of the thyroid to bring about rather serious consequences.

DR. WALTER TIMME said he agreed largely with the statements made by Dr. Rogers. First, as to non-operative procedures in children, most of these cases had their origin in emotional shock or heredity. These overturned the balance of internal secretions, but it was frequently restored spontaneously at puberty or after the establishment of menstruation. There

were many other cases without exophthalmos due to depressions at the critical times in the child's life, and if surgical interference could be held in abeyance until the child passed through them it should be done. Dr. Peterson mentioned a case in which after operation thyroid feeding stopped tetany. In cases in which tetany was produced by excision of the thyroid it was due to the fact that the parathyroids had been impaired in their activity. If the thyroids alone were excised this effect was not produced. Cases treated by the X-Ray in which the thyroid disappeared sometimes showed tetany and spasmophilia because of this interference with the parathyroids which had decreased their activity. These cases showing tetany should be treated with calcium salts and parathyroid secretion. Dr. Peterson had spoken of the importance of iodine in the management of these cases. If the iodine content was increased it increased the capacity of the thyroid as a reservoir and hence caused a diminution of thyroid in the body. The substance which Dr. Kendall has isolated was a hormone which had toxic properties, the "A" portion of which was insoluble in acid and this hormone produced in cretins and in animals used as controls certain effects; and yet that portion "B" which was soluble in acid did not seem to contain these toxic properties; nevertheless it did have an effect for betterment when administered to cretins. This would seem to bear out the theory that there was at least one other hormone that was not contained in the "A" crystals, the rest of the thyroid containing others. If thyroid preparation was given to myxedema patients the nitrogen balance was disturbed and yet in no case cited by Dr. Janney had an account been given of the nitrogen thrown off in the perspiration. It was well known that in myxedema patients the skin was dry and when thyroid was administered the skin lost this dryness and became moist. This nitrogen that did not come out in the urine or feces must be accounted for as it was not necessarily used by the cretin in growth. The relationship between the thyroid, thymus, pituitary, and adrenals was such that no statement could be made regarding the increased blood pressure as due to one or another of these glands. Thyroid disturbance could never be integrated in terms of thyroid alone, but one must take into consideration the effect of every other gland of internal secretion.

DR. NELSON JANNEY, in closing the discussion, said there was one omission to which he wished to call attention. An ade-

quate explanation for the cause of the toxic symptoms in exophthalmic goiter had never been advanced by writers on this disease. The following chemical hypothesis had long seemed reasonable to him: It was well known that very slight changes in the constitution of various complex substances occurring in the organism might lead to a normal body constituent becoming under abnormal conditions a deadly poison. Thus the amino-acid histidine, which occurred in body protein through the simple replacement of its acid group ( $\text{COOH}$ ) by an amino group ( $\text{NH}_2$ ) became B—Imidazolyaethylamin. The latter compound was highly toxic. In applying this consideration to the thyroid, we might observe that Kendall considered his hormone to be diiodo-oxyindol which also contained the acid— $\text{COOH}$  group. It seemed, therefore, not improbable that through a metabolic defect, the proper synthesis of the hormone in Grave's disease might be replaced just as in the example above quoted of the— $\text{COOH}$  group by the  $\text{NH}_2$  group. This would probably lead to the production of a toxic substance, which might be responsible for the toxic symptoms.

The point had been brought up by Dr. Timme as to whether the elimination of nitrogen in the preparation might have influenced the nitrogen balances obtained in our investigations. It was, however, known that but very little nitrogen escaped through the sweat. It was also to be remembered that the nitrogen balances in our patients unusually increased during thyroid periods. If the administration caused, as might be supposed, an appreciable increase in the loss of nitrogen through the skin by stimulating perspiration, the effect on the balance should be a decrease and not an increase as they had observed.

With regard to the question of the rationale of trying the hormone in hyperthyroidism, the writer stated that the many fruitless attempts to treat this condition with thyroid preparations were, of course, known to them. He felt, however, as we had finally the real active principle of the gland in our hands a control of such former therapeutic studies was indicated in this case.

A last point, not especially alluded to in the paper or the discussion, was the excellent means we now had of ascertaining the underlying condition of thyroid patients by use of the clinical calorimeter. This instrument was now being gradually installed in the largest hospitals.



# THE PHILADELPHIA PEDIATRIC SOCIETY

## ANNUAL FREDERICK A. PACKARD LECTURE

*Regular Meeting Held February 13, 1917*

THE PRESIDENT, JOHN F. SINCLAIR, M.D., IN THE CHAIR

### HYPERTROPHIC STENOSIS IN INFANTS

DR. L. EMMETT HOLT—The data which form the basis of this paper have been derived from a study of 141 cases. These patients have been treated in a variety of ways both medically and surgically. Microscopical examinations of the stomach have been made in 12 cases by Dr. Wollstein, pathologist to the hospital. Of the infants who recovered, 3 have been lost sight of; 10 died subsequently from other conditions; the remaining 64 have been followed almost up to the date of writing, 12 of them for a period of 4 years or over.

The clinical course and the uniform pathological findings have convinced my colleagues as well as myself that a division of cases of pyloric stenosis of infants into spasmodic and hypertrophic types is not admissible.

In hypertrophic stenosis the pylorus forms a tumor which is about as large as a peanut or the last phalanx of the little finger. It is of a glistening white color and has a cartilaginous hardness. The opening into the duodenum may be so small as to admit only the finest probe. In some cases even water cannot be forced through, but usually the normal opening is only much narrowed. On longitudinal section the hypertrophy is seen to involve not only the pyloric ring but the entire antrum which may be 2 or 3 times its normal thickness. It has a pearly-white color and seems to be almost destitute of blood vessels. In recent cases there is usually a considerable amount of edema. Microscopically the longitudinal layer, the submucous and the mucous coats are in most cases quite normal; the lesion is practically limited to the circular muscular layer. The circular fibres are much increased both in size and number. There is a true hypertrophy. The walls of the stomach are often found somewhat thickened and its cavity is generally dilated. The intestines are frequently empty and collapsed. There are no other lesions of importance.

It is our firm belief from our observation of these cases in the early weeks that in all hypertrophy precedes the tonic spasm; but that the hypertrophy continues long after the spasm has subsided we have absolute proof.

The clinical picture presented by a case of hypertrophic stenosis is a striking one and in a large majority of those seen it is remarkably uniform. An infant, usually breast fed, who has nursed well, gained normally in weight, has had sufficient and well-digested stools and in fact has shown few or no other signs of disturbance begins to vomit persistently and forcibly. These symptoms have their most frequent beginning in the third or fourth week of life, and in most cases their onset is abrupt and without assignable cause. To the forcible vomiting are added marked constipation, steady loss in weight and all the symptoms belonging to failing nutrition. Careful examination reveals definite gastric peristaltic waves and in most cases a palpable tumor in the pyloric region. While a palpable tumor cannot be considered essential to the diagnosis, it will usually be found by a careful observer under favorable conditions.

Abnormal gastric retention is easily estimated by emptying the stomach 2, 3 or 4 hours after a test meal by means of a simple suction apparatus composed of a rubber catheter, a small laboratory wash bottle and a suction tube. The test meal we have usually employed is 2 or 3 ounces of breast milk; diluted condensed milk answers the purpose; but one should not employ mixtures of unboiled cow's milk, as the coagulated milk in the stomach may block the tube.

The diagnosis of hypertrophic stenosis in most instances is easy, provided one is familiar with the disease, for the symptoms in fully four-fifths of the cases are classical. In some, especially of the milder forms, several days of close observation may be necessary. Enumerated in the order of their diagnostic importance I would place the points in the following order:

- 1—The history, if obtained from a reliable mother or nurse.
- 2—Abnormal gastric retention, observations being repeated 4 or 5 times at least.
- 3—Persiltaltic waves, not of diagnostic value unless typical.
- 4—The presence of a palpable tumor.
- 5—Wasting, constipation, scanty urine, etc.

It is doubtful whether the X-Ray tells more than can be

learned from careful observations of the gastric retention as described above. Furthermore, it must be remembered that these patients are very young, most of them in very bad condition and that they bear the manipulation incident to successive investigation with the bismuth meal very badly.

The medical treatment of hypertrophic stenosis consists in careful feeding and stomach washing. The gastric lavage should be practised at first twice a day, later at longer intervals; it serves the purpose of emptying the stomach thoroughly of mucus and fermented food; the water used should be warmer than usual, that is, up to 112°F. If it can be secured, breast milk is the preferable food, but one not rich in fat is desirable. The common practice of weaning as soon as symptoms develop is most unwise. In default of breast milk a modified milk mixture low in fat should be employed.

With respect to quantities and intervals of feeding, cases respond differently. We have usually depended on from 1 to 3 ounces at 3- or 4-hour intervals, or small quantities and shorter intervals, especially if the food is breast milk; with the longer intervals water should be given between feedings. In greatly prostrated patients hypodermoclysis should be used daily; from 150 to 250 cubic centimeters of 4% dextrose may be given in a saline solution at one time. Rectal feeding is of little assistance. The bowels are usually best moved by enema. Drugs and local applications of heat over the epigastrium for the purpose of allaying the spasm I believe to be of little value. The weight should be carefully watched and taken daily as it is the best guide to the patient's condition and progress.

*Surgical Treatment*—In 1908 Dufour and Fredet collected published results in 135 operations. The principal groups were:

Gastro-Enterostomy . . . .	52 cases with 22 recoveries
Divulsion . . . . .	36 cases with 21 recoveries
Pyloroplasty . . . . .	22 cases with 13 recoveries
Various modifications and combinations . . . . .	25 cases with 12 recoveries

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135

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68—Mortality 50%

In 1913 Rammstedt of Munster reported a successful case in which he simply divided the circular muscular layer of the pylorus by external incision. His case, a typical one, made an

excellent recovery. He advocated this procedure as a substitute for the older operations—gastro-enterostomy, divulsion and pyloroplasty—then in vogue. The great advantages he claimed were that the stomach was not opened and the duration of the operation was much shortened. In his case it required but 15 minutes as compared with 30 to 50 minutes needed for most of the other operations.

Rammstedt's operation of external muscle division has been done in the hospital up to January, 1917, in 67 cases, all but 1 of these by Dr. Downes. Up to January, 1915, it was done occasionally; in all upon 6 patients. But since that date it has been done exclusively in the institution. In 19 of the first 20 cases, in order to make sure that the constriction had been completely divided, the stomach was opened and a sound passed through the pylorus. This was then decided by the surgeon to be quite unnecessary and hence discontinued in the last 47 operations. It certainly adds to the operative risk.

Including my private cases and those operated on at the Babies' Hospital there were 41 gastro-enterostomies with a mortality of 51%; of the 28 cases done by Dr. Downes the mortality was 43%. Of the 67 cases in which the Rammstedt operation was done the mortality was but 24%.

The advantages of this operation are evident to one who has had experience with the other operations proposed. First in importance may be mentioned the time required. Seldom does the entire operation consume over 15 minutes and it is often completed in 10. The stomach is not opened and the risks of non-union, leakage and peritonitis are eliminated, and a minimum handling of the viscera is required. So much for the surgical aspects. Our experience has shown that the shock is much less severe, the temperature reaction is less marked, food can be pushed more rapidly and disturbances of digestion, particularly diarrhea which has been so troublesome a symptom after gastro-enterostomy in more than half our cases, is very much less frequent and less severe. This is undoubtedly due to the fact that the food passed normally into the duodenum instead of directly into the jejunum.

*After Treatment*—The success of operative measures in this condition is dependent in no small degree upon the after treatment. For a number of days after the operation the lives of



these little patients often hang by a very slender thread, and errors in judgment, especially with regard to feeding, often have the most disastrous consequences. It is then of the highest importance not only that the operation be done by a skilled surgeon but that the infant, after the wound is closed, be under the care of one equally skilled in the postoperative management. The problems presented to the physician are often more difficult than those of the surgeon. Hence hospital care is for most patients indispensable.

*Medical vs. Surgical Treatment*—On the whole is medical or surgical treatment of hypertrophic stenosis in infancy to be advised? It must be admitted that there appears to be considerable difference of opinion among those with some experience in this disease. Some physicians have reported groups of cases with so low a mortality as to lead to the inference that nearly all these patients recover without resort to surgery. While some surgeons have taken the position that the condition is purely a surgical one and that the patient should be turned over to them as soon as the diagnosis is made; that medical treatment is in most cases only waste of time and jeopardizes the life of the child because he does not come to the surgeon until so late that the chances of successful operation are greatly reduced. To what is this difference of opinion due? Are the physician and the surgeon talking about the same clinical and pathological conditions? I do not believe that they always are. Hypertrophic stenosis, we would repeat, is a definite pathological entity, though the cases differ much in severity. This is the condition that the surgeon and the medical consultant see. There are, I believe, a number of pathological conditions in early infancy associated with vomiting which have many of the symptoms seen in hypertrophic stenosis, but which on close study are seen to be quite different. There are also different conditions in which there is visible gastric peristalsis—even this symptom does not put the cases in the same class with those we have been discussing. A large proportion of such cases recover with medical treatment only, as do also most of those of hypertrophic stenosis of the milder type, although probably in very many of them the correct diagnosis is not made.

If the child is seen in private practice with the possibilities of the best care and most intelligent feeding—particularly breast

feeding—if the weight is stationary or the loss in weight is not great and the child still in good condition, if the vomiting is only 2 or 3 times a day, if the stools are fecal, and if no surgeon with experience in these cases is available, one is justified in waiting.

On the contrary, if the weight has fallen to 6 pounds or below and the loss is still going on, if the vomiting is continuous, if there is marked gastric retention, if the stools contain no fecal matter, no time should be lost, but immediate operation advised, particularly in a hospital, whether a tumor is palpable or not.

No better argument can be adduced for operative treatment than a comparison of our results at the Babies' Hospital in the 3 periods into which I have divided our experience. During the first period up to the end of 1911 our policy was operation only after a prolonged trial had been made of medical treatment, surgery being looked upon as a last resort. Our mortality for this period was 58% of 41 cases, 24 of which were treated without operation, the percentage results in the operative and non-operative cases being the same. The average age of the patients was  $7\frac{6}{10}$  weeks and the average weight at first examination was  $7\frac{7}{10}$  pounds.

Turning now to the final results in the operative cases we will first consider those after gastro-enterostomy. Of the 20 who recovered, 1 died 2 weeks and 1 died 4 weeks after operation, of enterocolitis; 1 died after 4 months, of diphtheria; 1 after 2 years from accident, and 1 was lost sight of. The remaining 15 patients have been followed up to the last few weeks. One seen after  $11\frac{1}{2}$  years is a well-grown, normal boy. Four were followed for from 4 to  $5\frac{1}{2}$  years, all were then quite well, but 1 had suffered from occasional attacks of vomiting up to his third year. Of 8 followed for 2 to  $2\frac{3}{4}$  years all were strong and healthy; but 1 suffered from vomiting attacks for nearly a year after operation. Judging from histories of these patients the operation of gastro-enterostomy in no wise interferes with the normal growth and development of children.

The Rammstedt cases have necessarily been observed for a much shorter time; but long enough to establish the fact that this operation does relieve the obstruction at once and completely. Of the 51 infants who recovered, 5 died subsequently; 3 of the infants within 2 months after operation, of causes connected

with the digestive tract. One of these was discharged in good condition on the thirteenth day, but died of marasmus 5 weeks later. Another also discharged in good condition died 4 weeks later of marasmus at home, the mother having lost her milk. The third did well for 9 days, was upset by over-feeding and died of gastro-enteritis on the twenty-fifth day after operation. In none of these could the operation be assigned as a cause of death. Two other infants entirely recovered from their gastric condition but died from respiratory infections later; 1 of empyema 3 months, and 1 of pneumonia 4 months after operation.

The remaining 46 infants have been followed up to the last few weeks. Many of them have been seen by me personally, others by some member of the hospital staff. From the remainder who live at a distance reports by letter have been received from parents or the family physician. The time elapsing from the operation to the date of last report is as follows:

In 4 cases between	2 years,	2 months and	3 years
In 14 cases between	1 year,	6 months and	2 years
In 12 cases between	10 months	and	15 months
In 11 cases between	5 months	and	8 months
In 5 cases between	1 month	and	4 months

When seen these children were almost without exception in the best of health; they were plump and rosy-cheeked, nearly all above average weight, and as fine a group as one would care to see.

Our experience, I think, warrants the conclusion that the Rammstedt operation meets the indications in this condition. If this simple procedure does this, then there is no longer any justification for the other more serious surgical procedures which have been employed in the past. Our mortality was only about half that which followed the operation of gastro-enterostomy. The statistics here quoted hardly represent what may be expected when this operation is done on private patients and done early.

#### CONCLUSIONS

1—Hypertrophic stenosis of the pylorus in infancy is a pathological entity. It should not be confused with other pathological conditions which may be accompanied by vomiting and occasional gastric peristalsis.

2—Many of the milder forms recover with only medical treatment.

3—All those which do not improve under such treatment in the course of 2 or 3 weeks, and the more severe types in a much shorter time, should be treated surgically.

4—The symptoms which indicate surgical intervention are rapid loss in weight, persistent vomiting, and forcible, gastric peristalsis; the presence of a palpable tumor and abnormal gastric retention aid much in diagnosis.

5—The X-Ray reveals nothing of importance which cannot be discovered by a study of gastric retention and without its dangers.

6—The cases which come under observation after 4 or 5 weeks of vomiting and marked loss in weight are best treated by operation as soon as the diagnosis is established.

7—The earlier operations of gastro-enterostomy, divulsion, pyloroplasty, etc., were unduly severe and prolonged; they should be abandoned for the simple external division of the circular muscular fibres proposed by Rammstedt.

8—Results by the same operator, upon the same class of cases in the same institution and with the same treatment show the great superiority of the Rammstedt operation to gastro-enterostomy and to medical treatment.

9—Cases of gastro-enterostomy followed from 4 to 11 years indicate that growth and development are not impaired by the operation.

10—Cases followed 2 and 3 years after the Rammstedt operation show no interference with health and progress.

11—Cases not operated on usually show no symptoms after the first year. Yet the possibility that this condition may be the basis of pyloric obstruction in later life undoubtedly exists.



## THE PHILADELPHIA PEDIATRIC SOCIETY

*Stated Meeting, Held March 13, 1917*

THE PRESIDENT, JOHN F. SINCLAIR, M.D., IN THE CHAIR

DR. WILLIAM J. TAYLOR showed a six weeks old baby with a congenital equinovarus of the right foot, and demonstrated a method, which he has found to be very successful in young infants, of stretching and moulding the foot into shape.

This treatment should be begun within a few days after birth, and the nurse should carry this out three or four times a day, being very careful not to irritate the skin and to produce no real pain. Within a week the foot and leg should be held firmly in a small tin splint by means of flannel bandages and later plaster-of-Paris casts should be used. These latter should be removed frequently—certainly once a week—and an effort made at each reapplication of the plaster of Paris to straighten the foot. The bones of the foot, in these young infants, are so soft and easily moulded that astonishingly good results can be obtained by this method of treatment without any form of cutting operation.

DR. ARTHUR H. GERHARD gave a ten-minute talk on chorea. Chorea is the commonest of all nervous diseases of children. M. J. Lewis's report of clinical studies of many hundreds of cases, in which he called attention to the seasonal distribution, shows a distinct increase in March and April, and again in the early autumn.

Dr. Gerhard called attention to the close interrelation of chorea, tonsillitis and rheumatism, and von Pirquet's expression of belief that they are manifestations of the same infection. Atypical rheumatism of children should be considered.

An important clinical point is the rarity of chorea in the well-to-do, and the inference is that this may be due to prompt attention to tonsils, eyes, rheumatic pains, etc.

The less commonly known concomitants of chorea are palsies, affection of speech, and habit tics succeeding true chorea. The commonly concomitant anemia, and the prevalence of hemic murmurs in first attacks, followed by true endocardial murmurs in the typical recurrences of the disease were mentioned.

Dr. Gerhard spoke of the value of aspirin in the treatment, followed by iron and arsenic during convalescence, and of

the necessity of regular rest, of keeping choreics away from "movies," and of depriving the patients of tea, coffee and sweets between meals.

The care of tonsils, eyes, teeth, circumcision, etc., in the disease is most important. The mild choreic movements, and apical murmurs, with the circulation maintained are not considered contraindications to anesthesia and surgical procedure.

Finally a query was made as to possible prevention of this very common disease by taking proper care of children with sore throats, eye-strain, rheumatic pains, etc.

DR. ALFRED HAND said that he wished to endorse the treatment with salicylates. He had been taught that Fowler's solution was specific, but thinks that salicylates now hold the first place. He gives soda bicarbonate before meals and aspirin after. He had found prolonged warm baths of much benefit in temporarily quieting patients.

DR. D. J. MILTON MILLER asked Dr. Gerhard the age of the youngest patient in Dr. Gerhard's experience. Dr. Miller's youngest patient was two and a half years. In this case the chorea had followed a tonsillitis complicated by suppurating glands in the neck. Dr. Miller asked whether the salicylate treatment was carried out systematically in all cases without other medical treatment, except of course rest and hygiene. He would also call attention to the occurrence of catarrhal colds in rheumatic conditions.

DR. H. K. HILL said that in the wards of the Presbyterian Hospital Dr. Hamill had been treating chorea patients by starvation with as good results as were obtained by medication. Chorea and rheumatism may come from other foci of infection than tonsils, for instance the gastrointestinal tract or the teeth. Dr. Hill mentioned a case in which choreiform movements had ceased twenty-four hours after the extraction of a tooth. Tonsillitis should perhaps be considered as the starting point of chorea in rheumatism rather than as an allied condition with chorea and rheumatism.

DR. WILLIAM DRAYTON said that while chorea patients got well when treated by rest in bed and light diet in combination with salicylate treatment. All reflex sources of irritation should with other drugs than salicylates, they improved more rapidly

be properly attended to—for example errors of refraction. Properly prescribed glasses cure the spasmodic tic following chorea, although they would not have any effect on chorea itself.

DR. JOHN F. SINCLAIR said that Crandall had worked out quite thoroughly the relationship of tonsillitis and rheumatism to chorea, and that either one or the other of these two conditions could be shown preceding about 50 per cent. of the cases of chorea.

DR. H. K. HILL asked the percentage of boys showing chorea at the Orthopedic Hospital.

DR. H. C. CARPENTER asked whether they had used the auto-serum treatment of Goodman. He would also like to know when Dr. Gerhard would advise the removal of tonsils in chorea.

DR. JAMES MCKEE said that he had seen but 2 cases of chorea which were not associated or connected in some way with the usual manifestations or with exudative diathesis. Of these 2 cases, 1 had followed typhoid and the other was associated with a tuberculous kidney. He also cited 3 cases in which the choreiform movements had ceased within twenty-four or forty-eight hours following tonsillectomy. One of these was a case of chronic chorea.

DR. GERHARD said that the youngest case he remembered was five years. He had had no experience with autoserum. The cases were all treated routinely with aspirin or other salicylates. As a rule, tonsillectomy was not advised during the very active stage of the disease, although in milder chorea a heart murmur was not a contraindication.

DR. WILLIAM B. CADWALADER demonstrated a patient with progressive muscular dystrophy. The patient was a girl sixteen years of age. The family history of this patient suggested that some abnormal congenital influences as well as those producing myopathy were present, for her brothers and sisters showed defects of development but did not have myopathy. The patient's condition developed at the age of four. She complained at that time of general muscular weakness. She stated that she had recovered almost entirely, but when twelve years old she was again seen by Dr. Cadwalader because the muscular weakness was returning. Since then her condition has not altered

appreciably. Examination showed that the face was not affected, but there was marked atrophy of the muscles of the proximal portion of both arms and of the shoulder girdles. The biceps of the left arm were hypertrophied, the muscles of both forearms were slightly hypertrophied, as were also the calf muscles. The tendon reflexes were diminished. Some of the muscles in the scapula regions showed fibrillary tremors. Dr. Cadwalader stated that fibrillary tremors were apt to be regarded as indicative of a lesion of the anterior horn cells. This, however, is not entirely justified, for it is known that fibrillary tremors occasionally occur in cases of pure primary myopathy.

Progressive muscular dystrophy may be a familial disease. It is a congenital but not necessarily an hereditary condition. In many instances no antecedent cases can be traced in the patient's family. Moreover, it has been shown, according to Gowers, that children of the same mother by different fathers suffer the same way. It generally makes its appearance after some acute infection. A sudden or acute onset has been recognized, but it is doubtful whether it is not merely an acute exacerbation of a latent condition. Its course is usually gradual and progressive. In rare cases dystrophy has been known to become arrested. Indeed, this patient's condition does not seem to have become worse in the past four or five years. Recovery has been reported a very few times, but there is still some doubt as to the accuracy of such observations.

*Pathology*—Progressive muscular dystrophy is essentially a disease of the muscles. It is an interstitial myositis. The cells in the spinal cord are occasionally affected, but not in the majority of cases.

Four years ago Dr. Corson White and Dr. Cadwalader (Medical Record, June 7, 1913) studied a number of patients afflicted with this malady in order to determine the frequency of the occurrence of syphilis. They found that syphilis was common in the parents and brothers and sisters of myopathic patients and that myopathy and syphilis were frequently associated. The relation of syphilis to progressive muscular dystrophy is not certain, but the frequency of syphilis would seem to be more than mere coincidence. However, this subject needs further investigation.

The relation of myopathy to disorders of the internal secretions has been carefully studied by Dr. McCouch and Dr. Ludlum



(Medical Record, June 10, 1916). They find the two conditions very frequently associated and are inclined to believe that they are related.

In the January number (1917) of the Archives of Internal Medicine, Dr. Timmie, of New York, published an article in which he calls attention to the fact that in a number of cases of myopathy he was able to recognize by X-Ray examination what appeared to be calcification of the pineal gland. He discussed the relation of the disturbances of the ductless glands to myopathy and concluded that a disturbance of the pineal gland is probably an essential factor in the origin of this disease.

Dr. Cadwalader thinks we should hesitate in accepting Dr. Timmie's conclusions, for it is known that the pineal gland in normal individuals is frequently calcified.

Krabbe ("On the History of the Pineal Body," Review Neurology and Psychology, June, 1915, p. 300) states that pineal consecrations may occur at any age and are constant after about the seventeenth year.

DR. G. G. DAVIS said that we should be very careful of prognosis in these cases. Occasionally they would remain stationary for several years and then improve. Either the cases were difficult to diagnose or the gloomy outlook was not certain.

DR. CADWALADER said that if the patient got well we should be uncertain of our diagnosis of progressive muscular dystrophy.

DR. WILLIAM DRAYTON said that while hysteria around puberty and during adolescence was common, it was uncommon in younger children. Some of the milder hysterical manifestations were not uncommon, but lasting hysterical stigma were rare. Dr. Drayton reported 4 cases, ages respectively seven, ten, eleven and twelve. In two of these cases there was complete blindness and in one partial blindness and in another there was inability to open the eyes. These 4 cases had been cured by such methods as rest and attention to hygiene, isolation from family, and suggestion by proving to the patient that he was not blind, but could read with his supposedly blind eyes.

DR. H. MAXWELL LANGDON, in talking on the ocular manifestation of hysteria, said that these cases demonstrated several points. The hysterical blindness which came on suddenly ceased suddenly, and the blindness which came on gradually disappeared

gradually. These children also showed another factor, namely, that they had, as a rule, an actual physical disability as a basis for their hysterical manifestation. There are two classes of hysterical blindness—in one of these the patient refuses to see, and in the other he sees but does not know it.

DR. CADWALADER said that real hysteria was uncommon. He spoke of Babinski's statement about the stigmata "caused by suggestion and curable by persuasion."

DR. ASTLEY P. C. ASHHURST demonstrated 2 patients with cerebral spastic paralysis and 5 patients with birth injuries of the shoulder. His talk was also illustrated by lantern slides. In the cases of birth injury to the shoulder some hold that the posterior dislocation often present is produced by injury at birth and others that the dislocation is the result of paralysis due to nerve injury at birth. At any rate remarkable improvement sometimes follows reduction of dislocation. Before three years of age this can be done by the bloodless method, but after this age open operation is preferable.

DR. G. G. DAVIS demonstrated the orthopedic treatment of infantile paralysis. The ordinary problems of such cases were taken up in detail and demonstrated on a patient. Dr. Davis said that radical operations should not be done before two to five years after the onset of paralysis. In other words, not before we were sure that there would not be continued return of power. Dr. Davis had not found difficulty in getting ankylosis in these joints in children, although this was contrary to the usual idea that ankylosis was not satisfactory before the epiphysis was ossified. Dr. Davis never caused ankylosis in the hip or knee, although he had found ankylosis of the foot a most useful procedure.

## DEPARTMENT OF ABSTRACTS

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### ORIGINAL CONDENSATIONS OF CURRENT PEDIATRIC LITERATURE BY THE EDITORS AND THE FOLLOWING ASSOCIATES

Charles E. Farr.....New York City	Rudolph D. Moffett.....New York City
Gaylord W. Graves.....New York City	Willard S. Parker.....Boston, Mass.
Howard K. Hill.....Philadelphia, Pa.	Mark S. Reuben.....New York City
Jerome S. Leopold.....New York City	W. P. St. Lawrence...New York City
William Lyon.....Jackson, Mich.	Mills Sturtevant.....New York City
John B. Manning..Seattle, Washington	Samuel W. Thurber....New York City
Stafford McLean.....New York City	Eugene F. Warner.....St. Paul, Minn.
Carlo D. Martinetti.....Orange, N. J.	Edwin T. Wyman.....Boston, Mass.
Raymond B. Mixsell.....Pasadena, Cal.	J. Herbert Young.....Newton, Mass.

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SCHAMBERG, JAY FRANK, KOLMER, JOHN A., AND RAIZISS, GEORGE W.: THE CHEMOTHERAPY OF MERCURIAL COMPOUNDS. (The American Journal of Syphilis, January, 1917, p. 1.)

The authors are working to produce new and superior compounds of mercury. Their conclusions follow:

(1) The most valuable scheme for the determination of the bacterial properties of new compounds is by the correlated employment of the antiseptic and germicidal tests *in vitro* and by the use of the drug in experimentally infected animals.

(2) The best method of determining the trypanocidal properties of new compounds is by the parasiticide test *in vitro*, the test *in vitro-vivo* and by the employment of the medicament in experimentally infected animals.

(3) Our test *in vitro-vivo* has shown itself to be more delicate in the demonstration of the trypanocidal activity of chemical compounds than any other test. Animals infected with trypanosomes treated with mercurial chloride by this method were for the first time kept sterile for a number of days, thus demonstrating some trypanocidal effect exerted by mercury.

(4) The fact that a chemical substance is strongly germicidal in the test tube is no evidence that it will exert a demonstrable influence on the same organism in the living body. Such substances, however, are more promising for chemotherapeutic investigation than those which are inert.

(5) Vegetable organisms such as the staphylococcus aureus and the bacillus typhosus are far more vulnerable to the action

of mercury in the test tube than to salvarsan. Indeed, mercury possesses stronger bactericidal properties in the test tube than any chemical agent with which we have experimented.

(6) Salvarsan, however, is not devoid of germicidal effect, as it kills the staphylococcus in the dilution of 1 to 2,000 upon prolonged exposure.

(7) Salvarsan, in our experiments, has shown itself to be, by far, the most powerful trypanocide in the test tube known. By the method *in vitro-vivo*, it destroys trypanosomes in dilution as high as 1 to 40,000. Bichloride of mercury shows markedly inferior values in this respect. The superiority of the influence of salvarsan over mercury in experimental trypanosomes is incontestable.

(8) In the test tube salvarsan exhibits a greater destructive influence on animal parasites, and mercury a greater destructive influence on vegetable parasites. Salvarsan is a powerful trypanocide and a feeble bactericide; mercury is a powerful bactericide and a relatively feeble trypanocide.

(9) Trypanosomes and spirochetes appear to act chemotherapeutically in a similar manner. Medicaments which have a destructive effect upon the former, likewise appear to exert a similar influence upon the latter.

(10) There is strong presumptive evidence that chemical substances which are capable of destroying trypanosomes in the animal body, exert a favorable effect in syphilis.

(11) The failure, however, of a chemical substance to destroy the parasites in experimental trypanosomiasis is, of itself, no proof that the medicament may not exert a favorable influence in syphilis.

(12) Our laboratory experiments on trypanosomes and spirochetes point to a greater selective affinity of salvarsan for the spirocheta pallida than is possessed by mercury.

(13) Mercuric chloride has a greater organotropic effect than salvarsan; in our experiments mercury was fifty times more toxic for white rats than salvarsan.

(14) A group of new organic mercury compounds has been prepared by us which far transcend mercuric chloride in their bactericidal powers in the test tube. One new compound has shown itself to be over thirty times more powerful in this respect, both by the Rideal-Walker and the "antiseptic" test.



(15) These new mercury compounds also exhibit a greater destructive influence upon trypanosomes than does mercuric chloride.

(16) Some of these compounds have shown a lower toxicity than mercuric chloride.

MILLS STURTEVANT.

ADAMS, JOSEPH E.: GLANDULAR CARCINOMA IN A CHILD AGED TWO AND ONE-HALF YEARS. (*British Journal of Children's Diseases*, September, 1916, p. 266.)

The author reports an interesting case. For three weeks the child had a bloody vaginal discharge. There was a palpable tumor present in the epigastrium between the bladder and the rectum. A catheter specimen of urine contained no blood. On operation, a rounded cystic growth about half the size of a tennis ball, attached to the roof of the vagina and with peritoneum over it, was incised. A portion of the cystic hemorrhagic mass was excised, it being too adherent for complete removal.

The vaginal hemorrhage ceased for a few days after the operation, but then reappeared and became more abundant. The child died two months after the operation.

On postmortem, a large growth completely covered with peritoneum was found in the center of the pelvic cavity. This was adherent to the posterior surface of the bladder and closely connected with the rectum posteriorly. There were several large mesenteric glands. The specimen consisted of the uterus and its appendages, the bladder, vagina and portion of the rectum. Microscopically, the growth was a carcinoma. CHARLES E. FARR.

WILE, ODO J.: THE SPIROCHETAL CONTENT OF THE SPINAL FLUID OF TABES, GENERAL PARESIS AND CEREBROSPINAL SYPHILIS. (*The American Journal of Syphilis*, January, 1917, p. 84.)

During the past year the author has inoculated the spinal fluid from 8 cases of acute cerebrospinal syphilis, general paresis and tabes dorsalis into the rabbit testes. The results have fortified his belief that the spinal fluid contains spirochetes and that as such it is an infectious fluid. Injections of the cerebrospinal fluid in 2 cases of cerebrospinal syphilis resulted in positive takes in both. Injections of the spinal fluid from 3 cases of general paresis resulted in positive findings in 2. Injections of the spinal fluid from 3 cases of tabes dorsalis resulted in positive findings in 1 and negative in 2. Wile concludes that the spinal fluid from

early cases of syphilis, tabes and paresis contains spirochetes, as demonstrated by transplantation into the rabbit testes. The spirochetes may be present in moderate, or even large, numbers in the rabbit testes without producing the classic gumma or chancre of the testes. In some cases slight enlargement of the testes itself may be noted. In still others spirochetes were demonstrated in which no increase in size of the testes was noted. In no case in this series were spirochetes demonstrable in the fluid before inoculation. The spinal fluid, at least in cases in which the nervous system is involved, must be regarded as infectious, and as such should be handled with the same care as other syphilitic secreta.

MILLS STURTEVANT.

LITCHFIELD, W. F., LATHAM, OLIVER, AND CAMPBELL A. W.:  
A CLINICAL AND ANATOMICAL REPORT OF A CASE OF FRIEDRICH'S DISEASE. (*Medical Journal of Australia*, February, 1917, p. 135.)

The patient, a girl of eight years, for two years walked in "a wabbling fashion," growing thinner and weaker. There was an inconstant nystagmus on lateral deviation of the eyes. The knee-jerks were absent and the plantar reflexes feeble. There was some loss of muscle tone, but no loss of sensation could be made out. A pes cavus existed on both sides. She died of typhoid fever. The autopsy showed two pathologic processes of the central nervous system, one long standing, the other acute. In the older process the posterior columns from the lower lumbar region upwards were swept bare of healthy fibers, with the exception of the posterior root zone and the cornu-commissural zone. As a result of this old process the dorso-lateral columns in the position of the direct cerebellar and the crossed pyramidal tracts were partially sclerosed. The acute process consisted of dottings in the field of countable diseased fibers in the lateral and anterior columns particularly in the region of the direct cerebellar and crossed pyramidal tracts and along the lateral and anterior margin of the cord. This acute process may have been due to the thyroid toxemia. There is a brief consideration of the theories of the origin of these cases. They are as follows:

Gowers promulgated the idea of an inherent tendency to early decay—an abiotrophy—of the parts involved. Newton Pitt's view was that there is an inherited tendency to general early vascular degeneration. Then the view favored in Germany that

the primary change is an agenesis, a faulty development of the posterior columns and the changes in the lateral columns as secondary or compensatory, in which the latter overloaded, soon degenerate. Lastly, the view of Williamson that the parts degenerate because they happen to lie in the segment of the cord wherein the blood supply is weak, namely, in the field supplied by the posterior spinal system of arteries. This view the authors favor.

JOHN B. MANNING.

COPELAND, ROYAL S.: TONSILS. (*Journal of the American Institute of Homeopathy*, March, 1917, p. 1026.)

The author discusses the large number of operations for removal of the tonsils now being done. He calls attention to the lack of knowledge of the functions of the tonsil, and suggests that removal may lead to subsequent deformity of the throat or affect the voice. He thinks mere size of a tonsil is never an indication for removal. It is conceded without argument or discussion that cryptic, ragged, frequently inflamed and painful, obviously diseased organs are worse than useless. If such tonsils fail to yield to internal medication or local treatment they should be removed. Copeland makes the significant suggestion that every tonsil enucleated during the next year be submitted to competent laboratory examination to see whether it is really diseased or not.

MILLS STURTEVANT.

GIBNEY, VIRGIL P.: OSTEOCHONDROITIS DEFORMANS JUVENILIS-PERTHES DISEASE. (*Medical Record*, May 12, 1917, p. 793.)

There are many lesions about the hip, such as periarthrititis, severe sprains, diastasis, perityphlic abscess, and non-articular rheumatism. After the work of Koch, the term hip disease began to be discarded and tuberculous arthritis of the hip and tuberculous coxitis came into use.

In 1910, Ligg described an obscure affection of the hip joint which gradually developed into a clinical entity. Perthes, in 1913, called it osteochondritis deformans juvenilis. In 1915, Delitala reported 6 cases and concluded that it was a congenital alteration either of the epiphyseal cartilage of the upper end of the femur or of the epiphyseal nucleus which gives way to processes of ossification, which are insufficient and irregular.

The X-Ray findings show a slight flattening of the femoral

head, a little later a lipping of the head over the neck and at a later stage a flattening of the epiphysis. There is seldom any destruction of the cartilage.

The symptoms resemble very closely those of tuberculous hip in the early stages, but become different as the disease advances. There is reflex spasm in tuberculous hip, but very little in Perthes disease, night cries in the one and not in the other.

A typical case of Perthes disease is shown when a child of 4 to 10 years begins to limp. In the absence of night cries and terrors, a physician is not consulted until a little adduction deformity appears. Very little pain and practically no shortening is found. Immobilization in plaster-of-Paris relieves the pain but does not apparently stop the process. CHARLES E. FARR.

KIMBERLIN, J. W.: THE CASE OF THE CROSS-EYED CHILD. (*Medicine and Surgery*, March, 1917, p. 109.)

The author urges that cross-eyed children be put under control of the ophthalmologist as early as possible, because little can be done for a child after he is six or seven. A majority of the cases of convergent squint are caused by errors of refraction. The exceptions are those cases of functional deficiency in which there is lack of central development. Convergent squint usually arises about the third year, when the child begins to look minutely at pictures and smaller objects, exciting the use of more accommodation. There are other forms and causes for squint, but these are rare. The three direct effects of squint are: Cosmetic, lack of binocular vision and blindness. The parents know only the cosmetic, but the others should be explained to them. A good understanding of the cause and effects of squint will in itself dictate the method of cure. We have the excessive accommodation caused by the hyperopia, so we get rid of the hyperopia by correcting it with a glass. We can also suspend the accommodation itself for any length of time we desire by the use of a cyclopegic like atropin. The lack of fusion we can overcome by training with the stereoscope or the Worth amblyoscope. The amblyopia from non-use we cure by compelling the blind eye to accept the burden of seeing by tying up the good eye. Results in the younger children are remarkable. Correcting glasses are put on the child when from two and a half to three and a half years old. MILLS STURTEVANT.



BRETON, PRESCOTT LE: A MODIFICATION OF THE USUAL CLUB-FOOT OPERATION BY THE ADDITION OF TENDON TRANSPLANTATION, TENDON FIXATION OR BOTH. (New York State Journal of Medicine, March, 1917, p. 115.)

The most popular method of correcting congenital club-foot of the severe type, is by tenotomy of resisting structures plus a wedge osteotomy of the head and the neck of the astragalus and sometimes of the cuboid and the os calcis in addition. A certain number of these cases so treated relapse in part, after 2 years.

The author believes that the effect, which is the deformity, and not the cause which is the unequal muscle pull, has been attacked. Therefore he has been adding to the wedge operation two procedures. These are, first, a tendon transplantation of the tibialis anticus and often the big toe extensor to the outer side of the foot, and secondly, the fixation of part or of the whole of one peroneal tendon in the fibula. The transplantation transfers the pull to the outer side and the fixation prevents the recurrence of the deformity.

The writer has operated on 17 severe cases and has done the transplantation 15 times and the fixation 6 times. In 3 cases both the transplantation and the fixation were used with good results. He believes that these measures are of great value when added to the usual operation for congenital club-foot.

CHARLES E. FARR.

LAMB, ROBERT SCOTT: SUBCONJUNCTIVAL INJECTIONS OF SALVARSANIZED SERUM IN THE MANAGEMENT OF OCULAR SYPHILIS. (The American Journal of Syphilis, January, 1917, p. 58.)

Lamb recalls his report in 1915 of over 100 cases of ocular syphilis treated with subconjunctival injections of salvarsanized serum. His work has been hampered by the difficulty in getting salvarsan for part of the time since his last report. He is, however, pleased with his results of using the drug in this way during such periods as he has been able to obtain it and recommends it in iritis, iridocyclitis, keratoiritis and interstitial keratitis. His method is as follows: A dose of salvarsan or allied material is given intravenously in the usual manner. At the end of an hour, 50 or 60 or even 100 c.c. of the patient's blood are drawn by means of venous puncture; clear serum thus separated, allowed to stand for an hour, then centrifugalized, is diluted to 40

per cent. with normal salt solution, heated to 56°C. for half an hour, then either hermetically sealed in ampules or kept cool until the following day, when it is put in ampules, capacity 1 c.c., and kept on ice a reasonable length of time, to be used whenever needed.

MILLS STURTEVANT.

SHARPE, WILLIAM: THE OPERATIVE TREATMENT OF HYDROCEPHALUS. A PRELIMINARY REPORT. (*American Journal of American Science*, April, 1917, pp. 555-563.)

The author believes that failure in the treatment of hydrocephalus is most often due to a lack of appreciation of the fact that the condition is rarely limited to a dilatation of the ventricles alone—the so-called hydrocephalus interna, which is caused by the blockage to the escape of the cerebrospinal fluid from the ventricles into the subarachnoid spaces by the obliteration of the aqueduct of Sylvius or the foramina of Majendie and Luschka. The condition is most frequently due to a lessened excretion of the cerebrospinal fluid through the subarachnoid cranial and spinal veins and possibly lymphatics—the so-called hydrocephalus externa.

To differentiate whether the condition is one of hydrocephalus interna or externa or both, several methods may be used. The method of Dandy and Blackfan finds the time of the excretion of phenolsulphonaphthalein, first from the ventricles and then from the spinal subarachnoid spaces, and the amount estimated in the urine. If practically the same amount and of equal duration, then the ventricles are not blocked and the condition is one of hydrocephalus externa. A ventricular puncture needle can be inserted into the ventricle through a very small skin incision at the anterior fontanelle as far from the median line as possible at the same time a spinal puncture needle is inserted into the lumbar subarachnoid space, with the patient lying quietly upon his side, the median line of the head being on the same level as the spinal canal, the pressure and the rate of flow should be the same from both needles if the ventricles and subarachnoid spaces are in free communication, therefore the condition is hydrocephalus externa. The Röntgen ray is of aid, the internal type producing convolutional markings throughout the vault of the skull.

Excluding the rare cases of hydrocephalus due to a tumor or a cyst formation in the posterior midbrain or subtentorially,

the author believes that practically all cases of hydrocephalus are due to a diffuse process—an original meningitis in its various forms.

In the series of 41 operated patients, the same method of drainage was employed except in the first 2 cases upon whom merely a bilateral subtemporal decompression was performed. Thirteen patients died, all except 1, in the first 36 hours from operative shock. In the remaining 28 patients the result has been most encouraging. The ages range from 10 days to 4 years.

The object of the operation has been to drain thoroughly and permanently the ventricles in the internal type and the subarachnoid and subdural spaces in the external type, outward beyond the cerebrospinal canal, beyond the dura into the subcutaneous tissues of the scalp, a most absorptive area. Six linen strands are inserted into the ventricles in the internal type and into the subarachnoid and subdural spaces in the external type and their ends brought out through the temporal muscle and fascia beneath the scalp in a stellate manner. As the linen is not absorbed for 6 months these artificial channels should become lined with endothelium or epithelium and their permanency and potency assured.

CHARLES E. FARR.

CHAPMAN, GEORGE: THE MILK CURDLING. (*Medical Journal of Australia*, May 17, 1917, p. 223.)

MOSELY, ARTHUR H.: PROPERTIES OF PANCREATIC JUICE.

They investigated the action of the pancreatic juice of a dog on cow's milk and noticed that:

(1) Pancreatic (cannula) juice does not curdle milk.

(2) The addition of hydrochloric acid or of calcium chloride, or of both these substances to milk does not give rise to clotting on the addition of inactivated pancreatic juice.

(3) Activated pancreatic juice does not clot milk, unless a soluble lime salt has been added to the milk.

(4) The addition of inactivated pancreatic juice and enterokinase to milk gives rise to coagulation when the pancreatic juice is not more than five hours old, when the quantity of pancreatic juice is less than 0.35 cubic centimeters to each 5 cubic centimeters milk, and when the amount of enterokinase is less than 0.03 cubic centimeters in the same amount of milk.

(5) The subsequent addition of enterokinase, or activated milk, to mixtures of milk and inactive juice leads to coagulation.

(6) The addition of hydrochloric acid or calcium chloride,

or both these substances, to milk assists the formation of a clot after the addition of inactive pancreatic juice and of enterokinase.

(7) Enterokinase alone does not cause clotting of milk.

(8) Inactive pancreatic juice, activated pancreatic juice and enterokinase all three causes the production of the "metacasein reaction."

(9) There is no evidence of the presence in pancreatic juice of a milk-curdling ferment identical with that in gastric juice.

(10) The milk-curdling property of activated pancreatic juice appears inseparable from its proteolytic ferment.

JOHN B. MANNING.

MURSK, L. D., AND SAUER, L. W.: THE NONPROTEIN NITROGEN OF THE BLOOD IN ATROPHIC INFANTS. (*The American Journal of Diseases of Children*, May, 1917, p. 397.)

The following conclusions are reached:

1—The blood of infants recovering from the milder intestinal disorders contains between 20 and 30 milligrams of nonprotein nitrogen per 100 cubic centimeters as determined by the method of Folin and Denis, agreeing with the values obtained by several authors for normal individuals. The urea nitrogen forms about 50% of the nonprotein nitrogen.

2—In atrophic infants the nonprotein nitrogen frequently exceeds 30 milligrams per 100 cubic centimeters of blood, and these findings seem to be associated frequently with a bad prognosis.

3—A low urea nitrogen associated with a low nonprotein nitrogen in atrophic infants seems to be a favorable sign.

HAROLD R. MINSELL.

WARD, GORDON: THE INFECTIVE THEORY OF ACUTE LEUKEMIA. (*The British Journal of Children's Diseases*, January-March, 1917, p. 10.)

The author has tabulated a study of 1457 cases of leukemia from the literature of various countries. In two tables arranged in 5-year periods, it was observed that chronic myeloid leukemia occurred in the majority of instances between 25 and 45 years of age, that chronic lymphoid leukemia occurs later between 45 and 60, and acute leukemia showed a decided preference for ages below 25 with a maximum evidence in the first 5 years, falling off rapidly from 5 to 10 years, but rising to a second maximum between 15



and 20 years. Sixty-five per cent or two-thirds of the entire series occurred in males. The acute form shows a relative preference for females in the first few years of life. The evidence of the facts dealt with in this paper are almost entirely against the infective nature of leukemia. These facts being:

(1) That there is a congenital form of leukemia which occurs in children whose parents are not leukemic.

(2) That leukemic parents have never been known to transmit the disease to the new-born child.

(3) That instances in which actual infection of one person by another might seem to have occurred are very few, although not necessarily devoid of significance.

(4) That in having a marked preference for a particular sex and age, leukemia differs from the infective class of diseases, and resembles the metabolic diseases and cancers.

JOHN B. MANNING.

SCHWARTZ, A. B.: THE BACTERIOLOGY OF THE URINE IN CHILDREN WITH VULVOVAGINITIS. (*The American Journal of Diseases of Children*, May, 1917, p. 420.)

The author's summary: In 18 unselected patients with chronic gonococcus vulvovaginitis, carefully catheterized specimens of urine showed a comparative absence of bacteria. The majority of the organisms encountered were either gram-positive cocci or diphtheroid bacilli. In most instances these were in such small numbers that they could easily be accidental contaminations from the urethra. The second portion of the urine, representing the bladder flora, was shown to be as free from infecting organisms as was demonstrated in a previous series of normals. The occurrence of vulvovaginitis did not increase the tendency to contamination of the bladder. Gonococcus cystitis may follow previous infections of the bladder by bacillus coli in patients with vulvovaginitis.

HAROLD R. MIXSELL.

ROLLESTON, J. D.: ISOLATED NASAL DIPHTHERIA. (*British Journal of Children's Diseases*, January-March 21, 1917.)

This paper is based on the occurrences of isolated nasal diphtheria among 3,000 cases of diphtheria which were under the author's care between 1902 and 1915. Of these only 55 cases, or 1.5%, were examples of isolated diphtheria, *i.e.*, diphtheria starting in the nose and remaining confined to that site as compared with 620 cases or 20.6% in which nasal diph-

theria was associated with the ordinary type of the disease. The diagnosis in each case was confirmed by bacteriologic examination. The largest number occurred during the cold months in young children. The commonest symptoms were headache, 16 cases; sore throat, 14 cases; vomiting, 8 cases, and shivering, 8 cases. The nasal discharge was watery in 16 cases, sanious, 11 cases, and purulent, 9 cases. The temperature was normal or subnormal in 11 cases. Albuminuria lasting 1 to 18 days occurred in 13 cases. All recovered excepting 3 infants, who were subject to congenital syphilis. The treatment, with exception of 3 cases, which received no antitoxin, consisted of doses ranging from 1,000 to 12,000 units. No local treatment was instituted other than keeping the nose clean. A local application of bouillon culture of *Staphylococcus pyogenes aureus* proved ineffective in nasal diphtheria. Chromicity was a characteristic feature of isolated nasal diphtheria, the difficulty in getting rid of the bacilli being explained by anatomic considerations. There is a historical description of the disease dating from 1861 when Jenner first described a nasal form of diphtheria, characterized by a sanious discharge from the nose and enlargement of the glands about the angle of the jaw, down to and including our most recent literature.

JOHN B. MANNING.

JOHNSTON, MEREDITH R., AND VEEDER, BORDEN S.: THE NITROGEN PARTITION IN THE URINE OF NORMAL CHILDREN. (The American Journal of Diseases of Children, May, 1917, p. 404.)

A summary of this article follows: A study of the nitrogen partition in the urine of 2 groups of healthy children was made to establish normal figures. One group was fed on an ordinary or standard diet containing meat and vegetables, with the quantity regulated by age periods. The second on a creatin-creatinin-free diet in which the quantity of food (and hence of nitrogen) was regulated according to body weight. In both groups the nitrogen partition was practically the same, with the exception of the uric acid nitrogen. Urea nitrogen makes up from 80 to 85%, and ammonia nitrogen from 3 to 5%. The combined figure for the 2 is less than 90, rather than above 90, as in adults. Creatin is constantly present, as is creatinin. The 2 combined form a smaller percentage than the creatinin alone in the adult. The amount of undetermined or "rest" nitrogen is high in children.

HAROLD R. MIXSELL.

# ARCHIVES OF PEDIATRICS

AUGUST, 1917

ROYAL STORRS HAYNES, PH.B., M.D. }  
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PUBLISHED MONTHLY BY E. B. TREAT & CO., 241-243 WEST 23D STREET, NEW YORK

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## ORIGINAL COMMUNICATIONS

### SUMMARY OF SEVEN YEARS OF CLINICAL AND LABORATORY EXPERIENCE WITH MENINGITIS IN NEW YORK CITY\*

By PHEBE L. DU BOIS, M.D.

AND

JOSEPHINE B. NEAL, M.D.

New York

The Department of Preventive Medicine of the Research Laboratory of the New York Board of Health was instituted in July, 1910, and to it was assigned the preparation and administration of the anti-meningitis serum. This work for some time previous had been carried on by the Rockefeller Institute, under the direction of Dr. Simon Flexner. To him belongs the credit for the development of the intraspinal use of the serum, although it had been previously prepared and used subcutane-

\* From the Department of Laboratories, Department of Health, New York City.

ously by Jochmann, Kolle and Wassermann in Germany and by the New York City Board of Health in this country.

Under the law, all cases of meningitis in New York City must be reported to the Board of Health within 24 hours. The purpose of the Department of Preventive Medicine is to afford to the physicians of the city, when they so desire, the expert assistance of physicians especially trained in the diagnosis of meningeal conditions of every sort and in the treatment of meningitis. To this end the members of the Division are prepared to respond at any hour of the day or night to requests for consultation, and their services are offered to the attending physician immediately upon the receipt of his report by the Board of Health.

Though the great majority of our consultations are held in the homes of the patients, we believe the expert assistance of the department's specialists to be quite as necessary and valuable when cases are treated in the hospital. Even the attending physicians of wide experience treat relatively few cases of meningitis, and therefore cannot possess the specialized knowledge and skill obtained by years of work devoted to this one branch of medicine.

Since the establishment of the department, consultations have been held in 1805 cases. These have included tuberculous meningitis, purulent meningitis of all kinds (meningococcic, pneumococcic, streptococcic, influenzal and staphylococcic); poliomyelitis, meningism in a variety of diseases, especially pneumonia and other acute infections in children; and many rarer conditions such as brain abscess, brain tumor, syringomyelia and syphilitic affections of the central nervous system. Of these last, however, we see but few.

During the Summer of 1916 the epidemic of poliomyelitis occurred. This, of course, greatly increased both the clinical and laboratory work of the division. To us were referred cases in which there was a difference of opinion as to the diagnosis between the attending physician and the department diagnostician. In these cases we performed a lumbar puncture and from a correlation of the history and physical signs with the spinal fluid findings endeavored to make the diagnosis.

The differentiation of meningitis from other conditions is based on the history of the case, the physical signs prevailing and the examination of the spinal fluid.



**SPINAL FLUID**—A normal spinal fluid is perfectly clear, and when drawn with the patient in a horizontal position, it flows slowly, drop by drop, perhaps 10-15 drops to the minute. The rate of the flow varies with the caliber of the needle used and with the resistance offered by the patient. Struggling and crying will increase the flow.

In *pathological conditions* the fluid is practically always increased in amount. It may be either clear or cloudy.

A *clear fluid* increased in amount usually indicates tuberculous meningitis, poliomyelitis or meningism, syphilitic involvement of the central nervous system, brain tumor or rarer neurological conditions. A clear fluid occurs very rarely in meningitis within the first 24 hours of the disease. A slightly cloudy fluid is sometimes found in rather acute cases of tuberculous meningitis and in poliomyelitis.

A *cloudy fluid* usually indicates (with the above exceptions) an invasion of the meninges by the meningococcus or another pyogenic organism.

In the routine examination of fluids cytological, bacteriological and chemical studies are made. Guinea pigs are inoculated with fluids from suspected cases of tuberculous meningitis. Smears and cultures are made directly from the sediment of distinctly cloudy fluids. However, cloudy fluids from treated cases of meningococcic meningitis are usually centrifuged to get into the sediment any organisms that may be present. This is more likely to insure a growth, if the organisms are few in number.

Smears from distinctly cloudy fluids are stained by the Gram method. Clear or slightly cloudy fluids are centrifuged for an hour at high speed. The supernatant fluid is decanted and the bottom of the centrifuge tube containing a few drops of the fluid is carefully scraped. All of the sediment from one tube, except what is used for the culture, is put on a slide, taking care to use with each specimen a fairly uniform area of the slide. In the case of slightly cloudy fluids a little sediment may be taken for a second slide, as the sediment of such fluids is stained both with Ziehl's stain and by the Gram method. The sediments of clear fluids are stained with Ziehl's stain.

From these smears the presence or absence of bacteria is noted, the number of cells is estimated as normal, slightly, moderately, greatly or very greatly increased and the percentage of

polymorphonuclears and mononuclears is observed. The presence of unusual cells is also noted, though for this purpose a blood stain is better. Occasionally it is necessary to do a capsule stain, though usually the ordinary Gram stain shows the capsule very well.

We do not make a cell count as routine for a number of reasons; first, as the number of cells was the first element in the spinal fluid examination to be studied, it has gained in the eyes of many an undue importance so that often laboratory workers, having made a cell count and relying on what they feel to be an exact piece of information, are content to stop at this point, omitting other at least equally important investigations; secondly, the exact number of cells is not easy to determine. In the hands of well trained laboratory workers counting the same fluid under the same conditions, decided differences in the count have been observed. This discrepancy is to be accounted for by the presence of a few red blood cells that are often found in the clearest fluid and are not gotten rid of as only a small amount of diluting fluid can be used. Crystals and other detritus may also be mistaken for cells. On the other hand a fixed and stained preparation leaves no doubt as to the exact character of the sediment. In doing cell counts in connection with the smear method, there were several striking instances of the greater reliability of the smear method; thirdly, there is nothing specially diagnostic about the cell count. While usually higher in tuberculous meningitis than in poliomyelitis, the counts overlap for so wide a range as to make it impossible to draw any definite conclusions; fourthly, as an hour or more usually elapses from the time the puncture is made in the home until the count can be made, it is not easy to obtain a uniform suspension of the cells, after they have settled out.

CYTOLOGY—In normal fluids and in meningism the cells are not increased and an average of not more than one cell to 4 or 5 fields will be found. Very rarely the cells are somewhat increased in meningism.

In poliomyelitis the cells are usually slightly to moderately increased, though sometimes the increase is very great. The type of cell is in most cases the mononuclear. In a few cases there is an excess of polymorphonuclears. It was once thought that an excess of polymorphonuclears was the rule early in the disease and that the mononuclears made their appearance later.

Further study has shown the excess of the polymorphonuclears to belong to a type of reaction, not to a stage of the disease. Polyform and endothelioid cells are often found.

In tuberculous meningitis the cells as a rule are moderately to greatly increased and the mononuclears predominate up to 95%. In a few instances the fluid is hazy with a preponderance of polymorphonuclears.

In a meningitis due to the meningococcus or other pyogenic organisms, the cells are usually enormously increased, with the polymorphonuclears predominating up to 98%. In 2 or 3 instances only have we seen very early in a meningitis a fluid with so few cells as to be nearly clear and with the organisms present. In a few cases of meningitis due to other organisms there have been but few cells with an overwhelming infection—a smear from the fluid resembling that of a pure broth culture of the organism. As cases of meningococcic meningitis clear up the number of cells decreases and the percentage of mononuclears increases. Before relying on the decrease in cells as a positive sign of improvement, however, one must be sure that the organisms have disappeared. That type of case is almost invariably fatal that has a rapidly decreasing number of cells with a persistence of organisms.

**BACTERIOLOGY**—The smears, stained as before noted, are carefully searched for organisms and in the case of purulent meningitis cultures are made on media suitable to differentiate them. Routine cultures from all fluids, clear or cloudy, are made in glucose ascitic veal agar, neutral to phenolphthalein—this being the type of media best adapted to the cultivation of the meningococcus.

Uncontaminated fluids from normal cases, meningism and poliomyelitis are invariably negative both by smear and culture. The sediment after centrifuging, as described above, is better adapted to our purpose than is the fibrin web in examining for the tubercle bacillus. As our fluids are brought to the laboratory from varying distances the formation of the web is disturbed; usually, moreover, we wish to examine a fluid without waiting for the formation of a web. By this method positive results are obtained as a rule in about 65% of cases. This is not nearly so high a percentage as that obtained by Dr. Hemingway at the Babies' Hospital by using the web, but she was able to make several punctures, if necessary, while we rarely see a

case of tuberculous meningitis more than once. It may be noted, however, that by this method the tubercle bacillus has been demonstrated in every instance in our last 30 cases.

From 5 to 7 cubic centimeters of clear fluids are always injected subcutaneously into the groin of a guinea-pig. After a month the pig is injected in the axilla with 1 cubic centimeter of crude tuberculin diluted to 3 cubic centimeters with normal saline. Usually, if it is tuberculous it is dead next morning. For proof of tuberculosis we depend on caseous inguineal glands, or tubercles in the spleen, or both, at autopsy. Clear fluids that have been contaminated will sometimes produce enlarged inguineal glands that may even go on to caseation, but tuberculin will not produce death in such cases. We are now engaged in classifying our cases of tuberculous meningitis to determine their distribution as to the human and bovine types.

The meningococcus is not necessarily intracellular and other organisms, as the pneumococcus or streptococcus, may be. Hence one should never rely on any stain except the Gram. As cases of meningococcus meningitis clear up, the organisms decrease in number and become more and more intracellular. Finally the cultures become sterile. Forty-eight hours should be allowed for growth before the culture is pronounced negative. Occasionally degenerated organisms can be demonstrated in the smear while the culture is sterile. On the other hand, sometimes especially early or late when the organisms are too few to be positively demonstrated by smear, the culture will be positive. When the organisms are very few, the culture and smear should be made from the centrifuged sediment to insure the largest possible number of organisms being present. As the meningococcus autolyzes quickly, fluids from cases of epidemic meningitis should be examined as soon as possible after being withdrawn. Examinations after 12 hours are likely to be unsatisfactory.

Occasionally early cases of any form of purulent meningitis will show a perfectly sterile fluid in the first and even in the second puncture. These cases should be treated as meningococcic meningitis until the specific organism develops, since it is so desirable to give antimeningitis serum early if the case is one of epidemic meningitis and any treatment is so unsuccessful in all other forms.

As the gram positive cocci—the pneumococcus and streptococcus—occasionally decolorize readily, care should be taken *never*



to make a positive diagnosis until opinion based on a study of the smear has been confirmed by the culture.

For some time the type of our pneumococcus fluids has been determined for us by Miss Valentine. Following is the tabulation of the results.

Type I — 6 cases.....	15.4%
Type II —16 cases.....	41 %
Type III— 6 cases.....	15.4%
Type IV—11 cases.....	28.2%

CHEMISTRY—The chemical tests that we use are the nitric acid ring test for albumin and the Noguchi butyric acid test\* for globulin. The albumin and globulin practically always run parallel, but they serve as a check on each other. The small amount of albumin and globulin present in normal fluids is marked ‡. The signs, +, +1, ++, +++1, +++, +++++, represent increasing amounts and serve as a rough quantitative estimation. The presence of glucose is tested by using an equal amount of Fehling's solution and spinal fluid and it is marked with regard to the speed and the amount of the reduction as —, +, +1, ++, +++, the latter being the marking for a normal fluid. The globulin reaction and the reduction of Fehlings should not be read for at least half an hour.

Normal fluids and fluids from cases of meningism give a normal chemistry. The rare exceptions to this in the fluid of meningism will be discussed later.

Poliomyelitis fluids usually show a slight to a moderate increase in the albumin and globulin and a normal reduction of Fehling's, but in a few instances, especially those showing the syndrome of Froin, the albumin and globulin are very greatly increased and the reduction of Fehling's is diminished.

Fluids from cases of tuberculous meningitis usually show a larger amount of albumin and globulin than do poliomyelitis fluids. The reduction of Fehling's varies from normal to —. The statement has been made that a point of difference between fluids of poliomyelitis and tuberculous meningitis is that fluids

\*This test consists in adding to 1 part of spinal fluid 2 or 3 parts of 10% butyric acid in normal saline—boiling, adding about 1 part of normal sodium hydroxide and boiling again. Too much sodium hydroxide spoils the test by redissolving the globulin.

from poliomyelitis reduce Fehling's, while fluids from tuberculous meningitis do not. This is not true. Almost 75% of tuberculous fluids show a fair to good reduction of Fehling's and a small number of poliomyelitis show a diminished form of reduction. In one instance a fluid from a case of heat prostration—otherwise normal, failed to reduce Fehling's.

In fluids from the purulent meningitides the albumin and globulin are usually moderately to greatly increased. In recovering cases of epidemic meningitis, these usually decrease as the inflammatory reaction subsides, but they have rarely returned to normal by the time treatment is stopped. Early in any of the cases of purulent meningitis there may be a fairly good reduction of Fehling's which disappears as the condition becomes worse. If a case of epidemic meningitis is fairly mild the reduction may remain good all through the disease. On the other hand, in many cases, it disappears at the height of the disease, to return as the patient improves. We have come to look upon the reduction of Fehling's as being of great prognostic value. We have pointed this out more at length in a report of a cured case of streptococcus meningitis, published in the *ARCHIVES OF PEDIATRICS*, January, 1915.

Two rather rare types of fluid are occasionally seen, both being due to some hemorrhagic process. In one of these the red blood cells are evenly distributed through the fluid—occurring in the same density when collected in different tubes, thus distinguishing the condition from an accidental puncture of a vein. The other indicates an older hemorrhage and illustrates the syndrome of Froin.

It is characterized by spontaneous coagulation and a yellow color. Both these fluids may occur in cases of poliomyelitis, but they are in no way diagnostic, as they are found in various other conditions.

During the summer of 1916 the opportunity was afforded us to do quantitative chemical studies on total nitrogen, non-protein nitrogen, urea nitrogen, creatine creatinin and sugar in the various types of spinal fluids. The details of the results and the technic is published in the *Archives of Internal Medicine*. Following is a table giving the median and the limits of the findings.

In the case of the poliomyelitis fluids it was observed that the quantities of the substances studied gave no indication as to the prognosis of the case. In epidemic meningitis, however,

if the patient was improving, the nitrogenous substance decreased and the sugar increased, while opposite results were obtained if the patient was growing worse.

TABLE II.

## QUANTITATIVE CHEMICAL STUDIES

		Total Nitrogen in Mgms. per 100 C. C.	Non-Protein Ni- trogen in Mgms. Per 100 C. C.	Urea Nitrogen Mgms. Per 100 C. C.	Creatinin Mgms. Per 100 C. C.	Creatin Mgms. Per 100 C. C.	Sugar
Poliomyelitis	Median	22.57	15.71	12.50	.400	.405	.0613
	Limits	34.00)	24.78)	26.60)	.9609)	.495)	.1063)
		16.37)	8.91)	5.06)	.2730)	.190)	.0250)
	Cases	25	16	17	22	11	53
Epidemic cerebrospinal meningitis	Median	47.25	21.93	9.25	.476	.704	Traces
	Limits	250.00)	136.25)	53.28)	.595)		.0628)
		47.25)	13.00)	3.66)	.326)		Traces)
	Cases	30	23	26	5	1	23
Tuberculous meningitis	Median	25.88	13.88	7.14	.626	.649	Traces
	Limits	34.50)	17.25)	14.18)	.7652)	.735)	.060)
		20.86)	12.82)	4.54)	.4870)	.563)	Traces
	Cases	10	5	8	2	2	6
Normal	Median	15.30	13.69	8.23	.365		.0815
	Limits	22.72)	22.38)	12.05)			.0923)
		9.67)	13.68)	5.35)			.0660)
	Cases	5	3	4	1	0	6

The Lange Colloidal Gold Test was done on 368 fluids in Dr. Geo. Draper's Laboratory by Miss Georgia Cooper. Of this number 158 were fluids from poliomyelitis cases on which our qualitative tests had shown increased albumin and globulin. With the Lange test the curves of these fluids fell into six groups, corresponding with our albumin and globulin findings. No one of these groups could be selected as especially typical of poliomyelitis. The test seems to have great value in the differential diagnosis between meningism and poliomyelitis, for in several instances of meningism where our routine tests showed a slight increase in albumin and globulin, the Lange test was absolutely negative.

TABLE I.  
CHARACTERISTICS OF THE VARIOUS FLUIDS

Meningeal Condition	Pressure	Amount c.c.	Appearance	Cytology	Bacteriology	Albumin	Globulin	Fehling's Solution	Animal Inoculation
Normal	Normal	5-10 c.c.	Clear	Very few cells	Sterile	+ —	+ —	++	Negative
Meningismus	Increased	A. 30-40 c.c. M. 100 c.c.	Clear	Very few cells	Sterile	+ —	+ —	++	Negative
Poliomyelitis	Increased	A. 25-50 c.c. M. 100 c.c.	Clear; sometimes slight fibrin web	Rarely polynucleosis; usually lymphocytosis up to 95% endotheloid and polyform cells	Sterile	+ + + +	+ + + +	+ + + +	Negative
Tuberculous meningitis	Increased	A. 30-50 c.c. M. 120 c.c.	Clear fibrin web	Lymphocytosis up to 95% rarely polynucleosis	Tubercle bacilli	+ + + +	+ + + +	+ + + +	Tuberculosis in four weeks
Epidemic cerebrospinal meningitis	Increased	A. 20-50 c.c. M. 120 c.c.	Cloudy	Polynucleosis up to 98%	Meningococcus	+ + + +	+ + + +	+ + + +	— to + according to severity and stage
Meningitis due to other organisms	Increased	A. 20-50 c.c. M. 100 c.c.	Cloudy	Polynucleosis up to 98%	Infecting organism	+ + + +	+ + + +	+ + + +	— may be + or even + early

A.—Average.

M.—Largest amount observed.

In any purulent meningitis with a very thick exudate the amount of fluid may be greatly decreased.



The 368 fluids were distributed as follows:

Poliomyelitis .....	158
E. C. S. M.....	57
T. B. Meningitis.....	42
Meningism .....	33
Pneumococcus Meningitis.....	6
Streptococcus Meningitis.....	3
Staphylococcus Meningitis.....	1
Other Diseases.....	11
Doubtful .....	57

From July 1st, 1910, to July 1st, 1917, we examined 4,350 fluids. Table I. is a concise statement of the various characteristics of different fluids.

HISTORY—The history of meningism depends, of course, on the underlying conditions, but the onset of meningeal symptoms is usually sudden.

In the case of poliomyelitis there is usually the history of an abrupt onset with fever. Quite occasionally there is a history of an anginal or a gastro-intestinal attack, especially the latter, preceding the true onset by 3 to 4 days. Rarely the onset is insidious.

In tuberculous meningitis the onset is usually slow, though in some few instances it is fairly abrupt. The history is commonly that of early irritability, followed by increasing stupor.

In all forms of purulent meningitis the onset is usually sudden and the history throws little light on the differential diagnosis. To be sure a history of pneumonia, otitis media, an operation on the nose or throat or injury to the head, may make one suspect the meningitis to be due to the pneumococcus or streptococcus rather than the meningococcus. It is unsafe, however, to rely on this and a meningitis under these conditions should be treated as an epidemic case until it is found that it is due to some other organism.

SYMPTOMS AND PHYSICAL SIGNS—In studying meningeal conditions the principal symptoms and physical signs to be considered are the following: Temperature, pulse and respiration; headache; mental condition—stupor, delirium, irritability, con-

vulsions; reflexes—equal or unequal, normal, increased or diminished, absent; the eyes—pupils, equal or unequal, dilated or contracted, reacting, conjunctivitis, strabismus, nystagmus, ptosis; gastro-intestinal condition—vomiting, diarrhea, constipation, bladder—retention, suppression; hyperesthesia; paralysis or paresis; stiffness of neck; MacEwen's\* sign or bulging fontanelle; Brudzinski\*\* Kernig, eruption, herpetic or hemorrhagic.

Certain of these signs, as headache, MacEwen, rigidity of the neck, Kernig, Brudzinski, occur in practically all meningeal conditions and have little diagnostic value, at least from the differential standpoint. Under each condition, therefore, the most important signs and symptoms will be indicated.

*Meningism*—In meningism there may occur as marked signs of meningeal irritation as in true meningitis, even to loss of knee jerks, dilation and rigidity of the pupils, strabismus or ptosis.

In the purulent meningitides the temperature is usually fairly high and irregular, but rarely a case of epidemic meningitis will have a temperature under 100°F for the entire course. Several cases of pneumococcic meningitis have shown very high temperatures, up to 107°F. The pulse is usually regular and fairly rapid. The slow pulse that might be expected with the increased intracranial pressure is seldom seen. The respiration frequently shows an irregularity in rate and depth, the so-called Biot type. Late in fatal cases Cheyne-Stokes respiration usually develops.

Delirium is not infrequent in any of the purulent meningitides, even in the epidemic type. In the fatal cases stupor often develops 24 hours or more before death occurs. Stupor may develop rather early in severe cases of epidemic meningitis that do not result fatally. Frequently, however, in the epidemic type the mentality is good, except for irritability.

Convulsions may occur, but they are uncommon except in very young children. Early the reflexes may be exaggerated. As the disease progresses they are usually lost, and they return again as the case improves. They are usually equal on the two sides. The pupillary reaction ordinarily disappears at the height of the disease, and the pupils are dilated. Conjunctivitis is frequently

\*MacEwen's sign consists in a change from the normal in the percussion note over the lateral ventricle, due to increased intraventricular pressure.

\*\*Brudzinski's sign is the flexion and eversion of the legs and arms when an attempt is made to flex the head on the chest.

present. Strabismus or ptosis occasionally develops. Vomiting often occurs early in the disease. Retention of urine occasionally occurs and should be guarded against. Paralysis rarely occurs. The stiffness and retraction of the neck are more marked in the purulent meningitides than in any other meningeal condition. In infants the stiffness of the neck is often so easily overcome as to make one doubt its existence, but when the infant is turned on the side the head is drawn back. Herpes is not infrequent in meningococcic meningitis and a hemorrhagic eruption is found in about 10% of cases.

In poliomyelitis the temperature is usually higher at the onset and of shorter duration than in the purulent meningitides. Those cases with a rapid pulse and respiration often have a serious prognosis. Delirium is rare in poliomyelitis. Drowsiness alternating with irritability is the rule. In some cases this drowsiness goes on to stupor, which lasts for 2 or 3 weeks, strongly simulating the picture of tuberculous meningitis. Convulsions may be severe and prolonged, in the higher type of the disease. The reflexes are often increased early—later they are diminished or lost. In the spinal type they are frequently unequal. This is often a helpful point in differentiating the case from one of meningitis where the reflexes usually show the same changes on both sides.

The pupils are usually equal and react to light. There may be nystagmus, strabismus or ptosis. Vomiting is frequently an early sign. There is constipation more often than diarrhea. In severe cases there may be retention or even suppression of urine. Hyperesthesia is almost always present. Paralysis or paresis occurs in a large percentage of cases, but many cases of poliomyelitis show no paralysis and of course paralysis may occur in purulent meningitides, tuberculous meningitis and syphilitic conditions of the central nervous system.

As a result of our rather considerable clinical work with poliomyelitis during the Summer of 1916, and the pathological studies made at that time by Dr. H. L. Abramson, of the meningitis division, it was decided that a classification of poliomyelitis on an anatomical basis and the degree of the lesion would be somewhat simpler to use than the 8 types described by Wickman, which is arranged on both a clinical and an anatomical basis. Wickman's classification, which is familiar to all, is as follows:

- 1—The spinal poliomyelitic form.
- 2—The form resembling Landry's paralysis.
- 3—The bulbar or pontine form.
- 4—The encephalitic.
- 5—The ataxic.
- 6—The polyneuritic (resembling neuritis).
- 7—The meningitic.
- 8—The abortive.

The classification we would suggest is the following:

I.—NON-PARALYTIC TYPE—Under this head are included cases in which the nerve cells are not sufficiently injured to produce paralysis. There may be weakness. Under this type should be classed meningitic cases and also those cases somewhat like tuberculous meningitis, but without motor disturbance, which we have called encephalitic, since the chief symptom seemed to be a depression of the sensorium. This is really only an accentuation of the drowsiness and stupor characteristic of the early stages. In these cases, the motor cortical areas are not involved.

II.—ATAXIC TYPE—Motor Nerve cells evidently not involved, but there is a lack of co-ordination, ataxia, nystagmus, etc. In some cases an ataxic gait is the only sign of involvement of the central nervous system other than the sensory symptoms. The anatomical basis for this is proved by the post-mortem findings of involvement of the cerebellum, Clarke's column and the inter-vertebral ganglia. This type is very rare.

III.—TYPE WITH CORTICAL PARALYSIS—The upper motor neurone is affected with resulting spastic paralysis. A true spastic paralysis is rare. More often are seen evidences of involvement of the upper motor neurone, increase of reflexes or severe and prolonged convulsions. These convulsions are general and epileptic in character and may last for several hours.

IV.—TYPE WITH SPINAL OR SUB-CORTICAL PARALYSIS—The lower motor neurone is affected with resulting flaccid paralysis. This is, of course, the most common form and the one first recognized and described.

In tuberculous meningitis the temperature is low and irregular. The pulse is quite uniformly irregular in force and frequency. This is a valuable diagnostic point. Early there is irri-



tability—later stupor, from which the patient can be aroused with difficulty, if at all. Convulsions often occur toward the end, in small children. The reflexes are usually lost fairly early, but in some instances they persist until late in the disease. They are usually equal on the two sides. The pupils are dilated, sometimes unequally and fail to react to light. Strabismus is not infrequent. Projectile vomiting ordinarily occurs at some time. Paralysis, other than that of the eye muscles, is rather uncommon, but it may occur.

**MENINGISM**—Meningism is a condition that is frequently met with and deserves some special notice. By meningism we mean that condition in which meningeal symptoms arise in the course of some disease, the cerebrospinal fluid being increased in amount but with rare exceptions normal in character. Some difference of opinion exists as to the use of the term. It was introduced by Dupré, who considered it a functional disturbance.

Other writers have used the term serous meningitis, pseudo-meningitis, meningitis sine meningitide and meningitis infectiosa circumscripta or circumscribed meningitis. This latter term is considered preferable by Plaut, Rehm and Schottmüller. Holt describes a case which showed at necropsy a circumscribed meningitis. Huber in an article on "Pneumococcus Meningitis and Meningism" inclines to the opinion that the pathological basis is a localized inflammation, usually of infectious origin.

In the face of this evidence we cannot deny that cases exist in which the clinical picture and the increased fluid is due to a circumscribed infection, but from our experience it seems quite impossible that this is often the case.

We have seen 265 cases in which the outcome was death in 73 cases, recovery in 116 and unknown in 16 cases. The diseases which the meningism accompanied are as follows:

Pneumonia .....	104
Gastro-intestinal disease .....	27
Scarlet fever (1 patient had pneumonia also) ..	11
Whooping-cough (2 patients had pneumonia also) ..	8
Typhus .....	4
Otitis media (1 complicated with pneumonia; 1 complicated with mastoid) .....	7
Erysipelas .....	5

Tetany .....	4
Nephritis .....	4
Measles .....	3
Influenza .....	2
Retropharyngeal abscess .....	2
Trichinosis .....	2
Concussion of brain .....	2
Spastic paraplegia .....	2
Diphtheria .....	3
Neuritis (1 with bronchopneumonia, also).....	2
Chicken-pox .....	2
Neurasthenia .....	2
Typhoid complicated by pneumonia .....	6
Orbital abscess .....	1
Epilepsy .....	1
Rachitis .....	1
Streptococcus osteomyelitis .....	1
Staphylococcus septicemia .....	1
Heat prostration .....	1
Endocarditis (1 with cerebral embolism).....	4
Cerebral thrombosis or hemorrhage .....	1
Sepsis .....	1
Tuberculosis (2 of spine) .....	5
Miscellaneous .....	21
Unknown .....	26

In most instances, though the patients were seen once, the progress was carefully followed through the physician in charge.

The meningeal symptoms did not progress, otherwise we would have done a second puncture. In two instances a second puncture was made, the fluid remaining normal, however.

In the case of streptococcic osteomyelitis, the necropsy revealed normal brain and meninges. In all fatal cases the severity of the accompanying disease or diseases was quite sufficient to account for death. Of course this by no means proves the absence of a localized meningeal infection.

We have seen but once a case of generalized meningitis following a meningism. This was a case with extensive burns. The first fluid was entirely negative. The second, 4 days later, showed a culture of streptococcus hemolyticus. Moreover, a relatively large number of cases clear up promptly. In view of

these facts, we believe that in most cases the disease is a functional one, probably of toxic origin.

In nearly all these cases a lumbar puncture was done. In some instances it was omitted, either because the symptoms had cleared up before the patient was seen by us or because with the accompanying disease we felt sure the condition was meningism and advised waiting. Latterly, we have done a lumbar puncture even though we have felt sure it was meningism, as the withdrawal of the fluid seems to hasten recovery.

Of course the amount of fluid depends on the stage at which the puncture is done. We have withdrawn very large quantities—from 80 to 100 cubic centimeters. In other cases the fluid has been but little increased above normal. It is commonly accepted that in a true meningitis the fluid is inflammatory in character—of the nature of an exudate. Such a fluid shows an increase in albumin and globulin and in the number of cells. On the other hand, in a meningism, as we use the term, the fluid is of the nature of a transudate. According to Anglada the albumin present in normal spinal fluid is serum globulin, while in meningitis it is serum albumin. Except in the cases noted below the cells have not been increased, neither has the albumin and globulin content, and Fehling's has been readily reduced. In all cases the fluids have been negative bacteriologically, by smear, culture and animal inoculation. In a few cases of meningism there have been slight changes in the cytology or chemistry or both. These have occurred for the most part in 3 groups of cases—first, cases with severe and prolonged convulsions; secondly, cases of the convulsive type of whooping-cough; thirdly, cases about to die. These changes are doubtless due to minute hemorrhages or to congestion. In 2 cases of typhus there were pathological changes—in one an increase of cells, 95% mononuclears; in the second, an increase in the albumin and globulin and also in the cells—100% mononuclears. In the third case of typhus, the fluid was bloody and in the fourth case a puncture was not done.

A case of tetanus showed a moderate increase in the albumin and globulin with a normal cytology.

In a case of cerebral embolism with a septic endocarditis there was an increase in the albumin and globulin with a normal cytology. In a case of cerebral thrombosis or embolism there was a slight increase in cells—also in the albumin and globulin.

Of course tetanus and cerebral embolism or thrombosis do

not represent a true meningism. In these cases there is a definite lesion in the central nervous system. So also in the case of spastic paraplegia, which showed a slight increase in the albumin.

In 3 cases of pertussis there was some increase in the albumin and globulin and in the cells. Two of these cases died the same day the puncture was done. The case of heat prostration showed a slight increase in albumin and the number of cells. This fluid did not reduce Fehling's, though repeated tests were made, and was the only fluid that did not do so readily. Two cases of pneumonia showed a slight increase in cells with a normal chemistry. So also did a case of polyneuritis and one of influenza. Two cases of tetany gave a normal or slightly increased cytology with a moderate increase in the albumin and globulin. A case, probably of generalized tuberculosis, showed a moderate increase in the albumin and globulin, with a normal cytology.

In a case of acute nephritis there was a moderate increase in the albumin and globulin, with a normal cytology. Doubtless, the increase was due to the urea nitrogen, which is greatly increased in the spinal fluid in this condition. A case, presumably of neurasthenia, but possibly syphilitic, showed an increase in the albumin and globulin. A case of gastro-enteritis, with severe convulsions, showed an increase in the albumin and globulin.

In a case of otitis media, there was a moderate increase in cells, 90% mononuclears, and a moderate increase in the albumin and globulin. After the tympanic membrane ruptured, the case cleared up. It is doubtless possible, especially in a young infant—this one was 5 months old—that the inflammation might extend to the meninges without an actual invasion of them by the micro-organism. In a case of diphtheritic tonsillitis there was a slight increase in cells and in the albumin and globulin.

Most of these cases, it may be seen, fall into the 3 groups described in a preceding paragraph. For most of the others there is some reasonable explanation. It must be remembered that the boundary between a normal cytology or chemistry and a *slight* increase is not easily defined.

Plaut, Rehm and Schottmüller include under the term "meningism" cases with spinal fluid in which there is an increase in albumin and globulin and in number of cells usually mononuclear, sometimes polynuclear. We feel that such instances may



sometimes be mild and recovering cases of epidemic cerebrospinal meningitis in which the organism has cleared up before the puncture was made. We have seen several cases ourselves in which, from the clinical history, the progress of the case and the character of the fluid we were convinced of the diagnosis, while we were unable to prove it bacteriologically. In other instances these may be cases of poliomyelitis. In view of the large number of cases with well-marked meningeal symptoms in which the spinal fluid is normal, we feel that we should exercise great caution and should have some very good reason for the change, before making a diagnosis of meningism with a pathological spinal fluid.

TABLE III.

NUMBER OF CASES BY YEARS, JULY 1, 1910, TO JULY 1, 1917

	1910- 1911	1911- 1912	1912- 1913	1913- 1914	1914- 1915	1915- 1916	1916- 1917	Total
Epidemic cerebrospinal meningitis .....	17	25	29	41	38	61	87	298
Tuberculous meningitis...	22	44	37	51	66	71	68	359
Other meningitides.....	11	7	11	18	19	32	26	124
Anterior poliomyelitis ....	1	25	16	5	11	78	347	483
Pneumonia .....	6	8	16	22	22	24	36	134
Other diseases .....	14	30	20	53	60	86	144	407
	71	139	129	190	216	352	708	1,805

EPIDEMIOLOGY—Twelve years have elapsed since the beginning of the last big epidemic. In previous times there has been a sharp increase in the number of deaths due to meningitis about every 10 years.

There are reasons to believe that another epidemic of meningitis may be approaching. The spring of 1916 showed an increase of cases over the preceding years and the spring of 1917 a still greater increase, as is shown in Table IV. Furthermore, an increase in epidemic meningitis has been noted during the past winter in various parts of the United States—Hartford, Philadelphia, Baltimore and the Middle West.

Meningitis, like poliomyelitis, is a disease for which apparently the majority of individuals have a natural immunity. While unquestionably an infectious disease, few cases give a history of direct exposure. We have seen more than 1 case in a family in only 8 instances. The first time the mother of a child 11 years old developed the disease 3 months after the child had

recovered. It would seem impossible that the mother contracted the disease from the child, yet one may ask why, since the mother was susceptible to the disease, she did not develop it when she was so closely exposed to it in caring for the child. In the second instance 2 brothers, adults, were sick in the same room. Most unsanitary conditions prevailed. The first had been sick nearly 2 weeks before the second became ill. The latter was a fulminating case and died in 3 days. The first died after an illness of 5 weeks. In the third instance, a brother and sister, adults, and the 8-year-old child of the sister were sick in the same apartment. The brother and sister fell ill within 2 hours of each other. Both died. The child was taken sick 5 days later than her mother and uncle but was treated early, within 24 hours. She recovered. A neighbor living in another apartment in the same house was taken sick the day before the little girl developed the disease. He also recovered. The fourth instance was that of a girl of 14 years and her brother of  $3\frac{1}{2}$  years, who developed the disease 2 days after his sister. The cases were mild and both recovered. The fifth instance was that of 2 sisters, 9 and 5 years respectively. The younger became ill 4 days after the elder and died within 48 hours. The older child recovered.

The sixth instance was that of a boy of 4 and a girl of 2 years. The girl became ill within 24 hours after the onset of the disease in her brother. Both recovered.

The seventh instance was that of 2 children in the same family, 1 of whom was taken sick on January 30, the second on April 2, an interval of over 2 months. Both recovered.

In the eighth instance a boy of  $4\frac{1}{2}$  years was taken sick on the 6th, his sister of 7 developing the disease on the 14th. Both recovered.

Considerable work has been done on the subject of carriers and it has been shown that a certain percentage of those in contact with patients carry the meningococci for a varying time in their noses and throats. While such carriers are doubtless a menace in times of epidemics, it would seem that they are not dangerous in ordinary times, since we do not see a tendency for secondary cases to develop in the neighborhood of our cases. It is possible, too, that with sporadic cases there are not so many carriers developing as during an epidemic. Our lack of success in demonstrating carriers in any considerable percentage among the contacts would seem to indicate this. As the meningococci

are highly susceptible to the action of argyrol, this may be used in the nose and throat of both patients and contacts.

TABLE IV.

NUMBER OF CASES OF E. C. S. M. DURING THE FOUR QUARTERS  
OF THE YEAR

	July- October	October- January	January- April	April June
1910-1911.....	—	5	3	9
1911-1912.....	6	4	10	5
1912-1913.....	4	6	9	10
1913-1914.....	2	4	16	19
1914-1915.....	3	10	12	13
1915-1916.....	6	7	19	29
1916-1917.....	11	15	18	43
Total.....	32	51	87	128

TREATMENT—The treatment of epidemic cerebrospinal meningitis resolves itself into 3 parts—prophylactic, specific and general treatment.

The prophylaxis consists in quarantining patients ill with the disease and those in contact with them who show meningococcus cultures from the nose and throat. In view of the low degree of infectiousness of the disease in ordinary times, it would seem that this is unnecessary except during epidemics.

It is possible that during epidemics active immunization might be tried, offering it both to contacts and to the public in general, following about the same technic as in typhoid. There is some evidence to indicate that antibodies develop after such a procedure and it is improbable that it can do any harm.

With the very few secondary cases that we have had, it has not seemed advisable to use it with contacts.

If with the oncoming of an epidemic a larger number of secondary cases develop, it would certainly be worth trying. It should also be offered to the public in general for it may be noted in going over the secondary cases that are described under epidemiology that most of them develop, either nearly simultaneously, showing that the infection was probably derived from a common source, or within a few days—before an active immunity could be developed.

As the meningococci are found in the secretions of the nose and throat and the urine, these should be disinfected and those

in contact with the patient should be taught how to avoid infection. Argyrol may be used in the nose and throat of the patient and contacts.

The specific treatment consists in the intraspinal administration of antimeningitis serum. This is a specific immune serum of therapeutic value only in meningococcic meningitis and then only when administered subdurally. In making a lumbar puncture, general or local anesthesia is not used. We think that general anesthesia is dangerous, and local anesthesia takes so much preparation and time that the overcoming of the pain does not compensate for the increased nervous tension on the part of the patient. Adults not acutely ill who submit to lumbar puncture for diagnostic purposes do not seem to mind much. The back is not very sensitive, and if the patient is held properly—lying on the side with the knees drawn up against the abdomen, the neck bent and the back well arched so that the intervertebral space will be as great as possible—and the operator is skilful there is very little pain. Never under any circumstances do we do it with the patient sitting up. Iodin is used over about 4 square inches immediately around the point of election for puncture and a sterile or bichloride towel is laid over the hips through which to find the landmarks.

The hands of the operator are scrubbed and disinfected with bichloride and every precaution is used to secure asepsis. When we consider how fatal is the result of an infection of the meninges with the staphylococcus, for instance, the importance of great care will be seen. We have never had a secondary infection of the meninges. Sometimes the skin has become infected in small children from soiled napkins. A Quincke needle, size 15 or 16, is used, and the puncture is made in the mid-line through the notch most nearly coinciding with a line drawn from crest to crest of the ilium. A piece of tubing about 15 inches long is attached to the metal connection that fits in the end of the needle when the stylet is withdrawn. To the other end of the rubber tubing is attached the barrel of a syringe. It is well to cut the rubber and insert a short piece of glass tubing near the metal connection so that the fluid flowing out or the serum flowing in may be seen. It is often desirable to attach the tubing in removing the fluid because by raising and lowering the glass container the rapidity of outflow can be regulated. A too sudden decrease in intracerebral pressure is undesirable.



Great care should be taken to have the patient securely held in a proper position. If the patient is delirious it may be necessary to make a rope from a sheet and pass it back of the neck and under the knees.

In doing a lumbar puncture much depends on the skill of the operator. While a beginner may be occasionally perfectly successful and an experienced operator may fail to go into the canal at the first attempt if the patient is not held well or may get a bloody fluid, the average of satisfactory punctures will be about in proportion to one's experience. The most difficult type of case is that of a very young infant without increased fluid. In these cases the dura, not being distended by fluid, is carried in front of the needle, so that as we finally penetrate it, we often hit the wall of the canal and get a bloody fluid. In some cases of this sort a very small, sharp needle seems to work better, but in general we get blood much oftener with a sharp than with a rather blunt needle, and a very small needle is unsatisfactory if the fluid turns out to be purulent.

When the fluid withdrawn is cloudy, antimeningitis serum is always injected at once even though it is suspected that some other organism may be the cause. The serum does no harm no matter what the organism may be, and if it is meningococcic meningitis the earlier the serum is administered the better. Later treatment depends on the examination of the cerebrospinal fluid. We have used streptococcus and pneumococcus serums in appropriate cases. No patient with pneumococcus meningitis directly under our supervision has recovered, but we know of 2 patients who did. One patient with streptococcus meningitis recovered, but no influenzal patient. Anti-influenzal serum furnished us by the Rockefeller Institute has been used in a few rather late cases without success.

As stated above, if the first fluid is cloudy we inject antimeningitis serum. It is warmed to body temperature and injected very slowly by gravity under the least possible pressure. This method was introduced by Koplik. A syringe is dangerous, and is probably responsible for many deaths following the administration of serum.

The gravity method is also valuable as a guide to dosage. While it is generally best to give not more than 20 cubic centimeters of serum even if a large amount of fluid is removed, and

while the dose should usually be less in amount than the fluid, there are cases where it seems necessary to give more than 20 cubic centimeters and there are others where the amount of fluid is small and it is desirable to inject a larger amount of serum. In these cases the ease with which the serum flows in by the gravity method is a valuable index of the size of the dose that may be safely administered. The size of the dose depends very little on the age of the patient. A very young child can usually be given 20 cubic centimeters if a large amount of fluid is withdrawn. During the first 2 years it was customary to give larger doses of serum at the start, often 30 to 40 cubic centimeters. A number of times during or immediately after the injection the patient went into shock. Respiration became slow and shallow or ceased, the facies pale and pinched and the pulse rapid and thready. This was very alarming, but never resulted fatally. If the needle was still in place some of the serum was withdrawn. Artificial respiration was used and hypodermic stimulation was given for the heart. These occurrences have been almost unknown since smaller doses of serum have been used.

At present it is the custom of the division to give not more than 20 cubic centimeters of serum for the first 2 or 3 doses. If the patient fails to improve the dose is cautiously increased, if it runs in easily by gravity.

We have seen a number of cases of undoubted dry taps during the course of cases of meningococcic meningitis. The serum ran in freely and showed the usual variation in movement depending on respiration. In such cases it is advisable to proceed very slowly and to watch the patient carefully for the slightest change in pulse and respiration. We think that possibly in some cases the exudative period is followed for a short time by one of decreased secretion. At any rate, a dry tap is frequently followed by one in which fluid is obtained. In cases with thick exudate that will not flow through the needle, gentle suction with a syringe may be tried. If that fails a little serum injected will sometimes start the flow. In very severe cases the serum may be injected every 12 hours until there is improvement. It is usually given each day for the first 4 days. Further administration depends on the patient's general condition, and the bacteriologic examination of the fluid. It *must* be continued daily until the fluid is sterile, as shown by a negative 48-hour

culture. If, as is unusual, the fluid becomes sterile before the clinical condition is greatly improved, the serum should be continued, but not necessarily every day. Puncture for the relief of pressure may have to be done several times during convalescence.

In treating cases it must be remembered that frequently the stiff neck is the last symptom to disappear and if the fluid has cleared up and the temperature stays down it may be entirely disregarded.

Usually from 4 to 6 injections are necessary, but 16 or more are sometimes needed. It is well to turn the patient from side to side so that no 2 successive punctures are done with the patient lying on the same side. That insures the emptying of the lateral ventricles in rotation.

The serum used during the first 4 years contained 0.2% trikresol; earlier it contained 0.3%. As is well known, the trikresol has been blamed by several physicians, especially Dr. Kramer of Cincinnati, for the fatal results that have been reported in a few instances following the injection of anti-meningitis serum, usually in young children. Hale, of the Hygienic Laboratory at Washington, and Auer, of Rockefeller Institute, reported experiments with dogs showing that serum containing trikresol is somewhat more toxic than unpreserved serum or that containing chloroform or ether. Auer carried on experiments with monkeys also, and showed that they were far less sensitive to trikresol serum than the dogs. Furthermore, in France, where serum without preservative is used, cases of shock and occasional fatal results are reported. We had never seen such a case, although we had administered the serum considerably over 500 times and to children of all ages, 14 of our patients being under a year old. In view of our experience with serum that had always contained trikresol, we could not believe that it was the cause of the fatalities. We thought, rather, that they were due to injudicious administration of the serum—too large doses, or too rapid increase of pressure, which is likely to happen unless the gravity method is used—or to an unusual susceptibility on the part of the patient. On account of the fear of trikresol—unfounded, we felt—that had been produced by these reports, it seemed advisable to try for a while the use of chloroform or a preservative.

The chloroform was used for over a year. It was found that it caused a great deal of pain during injection, so much so as

to interfere with the proper dosage. For this reason mainly it was discontinued. A report of the comparison of the 2 preservatives by Neal and Abramson was published in the Journal of the American Medical Association, April 7, 1917, Vol. LXVIII., pp. 1035-1037.

If a case shows a tendency to become chronic an autogenous vaccine is made and given every 4 or 5 days in doses of from 250 to 1,000 million. Sometimes it has seemed to be very effective, but we have not had enough cases to be able to draw definite conclusions. We can say that we have never seen it do any harm.

The use of hexamethylenamin (urotropin) comes between general and specific treatment. We recommend its administration in all acute meningeal infections. It is said that 20 minutes after its administration formaldehyd can be detected in the spinal fluid. It may not be there in sufficient amounts to do much good, but the procedure seems rational. The fact that meningococci may be isolated from the urine is another argument for its use. It certainly is of value in preventing cystitis if retention develops, as it often does.

In 1 case of pneumococcus mucosus meningitis we gave hexamethylenamin dissolved in normal saline intraspinally. The temperature dropped from 106° to 102° F., and the patient became rational, but the case terminated fatally.

In planning the general treatment it is necessary to remember that epidemic cerebrospinal meningitis may be a greatly prolonged febrile disease. The patient is best kept in a quiet, darkened room. Sedatives are needed if the patient is very restless. The patient must have rest. If small doses of bromide or chloral do not hold the patient, it is best to give opium or some derivative rather than to risk depressing the heart by larger doses of bromide.

We have had 1 fatal prolonged case in which we thought the patient might have been saved had the doctor given her an opiate so that she might occasionally have had a few hours of rest. The bowels and bladder should receive careful attention, particularly the bladder. Retention and cystitis are not uncommon. The patient should be examined for a distended bladder daily and the family warned to report infrequency of micturition. Patients should not lie in a draught and should be carefully covered up,



especially during and after puncture. We have learned by bitter experience how easily they fall victims to pneumonia. In ordering the hygiene of the sick-room it must be remembered that the meningococci are found in the secretions of the nose and throat and in the urine. The diet should be such that it may be easily digested, but generous in amount, as soon as the vomiting ceases. The high caloric diet of typhoid is indicated for the reason that meningitis, like typhoid, may be prolonged. Small quantities of food must be given frequently. The ice-bag gives a measure of relief for the headache.

Cerebrospinal meningitis is so serious a disease that no point that may aid in the recovery can be safely omitted. Especially do the restlessness and the feeding require careful attention.

Table V. shows our mortality statistics for the 7 years from July 1, 1910, to July 1, 1917.

TABLE V.

MORTALITY, JULY 1, 1910, TO JULY 1, 1917

	Total No. Cases	Patients Recovered	Patients Died	Result Unknown	Mortality Per Cent
1910-1911.....	17	10	7	0	41
1911-1912.....	25	7	15	3	60
1912-1913.....	29	17	12	0	41
1913-1914.....	41	30	11	0	26
1914-1915.....	38	25	13	0	34
1915-1916.....	61	39	17	5*	28
1916-1917.....	87	64	19	4†	21

The 1911-1912 statistics need some explanation; 4 cases developed into basic meningitis and in five other fatal cases the patients were either in hospitals already or were sent there and we had slight oversight of the treatment.

Of the 17 cases dying in 1915-1916, 1 had a serious heart condition, 1 case in a hospital developed an abscess at the point of puncture. Laminectomy was advised by us but was not done. The meningeal symptoms had entirely cleared up. Two were fulminating cases. One case developed basic meningitis.

Of the 18 cases dying in 1916-1917, 1 had cardiac complication, 2 moribund when seen, 1 had *B. coli* infection developing in hospital after it had left our care, 2 developed basic meningitis, 1 had secondary streptococcal infection evidently from the blood.

\*Five not counted:

3—Treatment refused.

1—Secondary infection in hospital.

1—Outcome doubtful.

†Under treatment.

COMPLICATION AND SEQUELÆ—Among the complications and sequelæ there has been:

Pneumonia in .....	13 cases
Basic meningitis in .....	16 cases
Paralysis in .....	6 cases
Hydrocephalus in .....	3 cases
Deafness in .....	7 cases
Cystitis in .....	2 cases
Serum rash in .....	9 cases
Iritis in .....	2 cases
Typhoid in .....	1 case
Scarlet fever in.....	1 case
Measles in .....	1 case
Purulent otitis media in.....	3 cases
Blindness or impairment of eyesight in..	6 cases
Arthritis in .....	5 cases
Brain abscess in.....	1 case
Abscess at point of puncture in hospital	2 cases
B. coli infection in hospital in.....	1 case
Streptococcic infection, evidently from blood .....	1 case

In no instance has a case of anaphylaxis occurred in our experience, but a few cases at least apparently of anaphylaxis have been described to us. In a certain percentage of cases, probably more than recorded above, serum sickness develops and is a very uncomfortable occurrence. The rash itches and annoys the patient greatly, the temperature shoots up sometimes 3 or 4 degrees and for 2 or 3 days the patient seems distinctly worse. Injections of adrenalin are of some value in controlling the eruption. A weak solution of carbolic acid or sodium bicarbonate may be applied locally.

In no case of well-defined basic meningitis under our observation has recovery taken place. At first we tried very hard to get such patients into hospitals for ventricular puncture, but as they all died we do not now urge it very strongly. The diagnosis of basic meningitis should not be made, we feel, on the occurrence of 2 or 3 dry taps. We have had a number of cases in which several dry taps occurred that cleared up. We have seen 1 case in which after 1 or 2 dry taps ventricular puncture

was resorted to, with recovery. On account of our own experience with many such cases, which cleared up under the more conservative treatment, we did not feel that the recovery should be attributed to the ventricular treatment. We feel that ventricular puncture is not a procedure to be resorted to without very clearly defined indications of a basic meningitis being present. The results obtained by it so far are certainly not encouraging and we do not know what harm may be done by the injury to the brain substance. The danger of a secondary infection is greater with a ventricular than a lumbar puncture, on account of the tendency of scalp wounds to remain open and the close proximity of the meninges to the surface.

In view of these considerations we feel that the use of ventricular puncture should be restrained rather than encouraged.

Of the cases with paralysis, 4 cleared up. One case of deafness cleared up entirely after the lapse of several months. The patients with typhoid and measles both recovered. We are much interested in the question of mental deterioration following meningitis and are following up our cured patients. In the course of time we shall have sufficient data from which to draw conclusions.

TREATMENT OF POLIOMYELITIS—Various methods of treating the acute stage of poliomyelitis were tried during the summer of 1916, without very decisive results. The intraspinal injection of adrenalin was endorsed by only a few after it had been used for a short time. The injection of human immune serum was quite extensively tried. Many wished to try it on account of the apparent analogy between the use of serum in meningitis and poliomyelitis. The pathology of the 2 conditions is, however, quite different. In acute purulent meningitis the process is limited almost entirely to the meninges, the substance of the brain and cord being little, if any, involved. In poliomyelitis the pathological picture is reversed, the substance of the brain and cord being primarily involved, while the inflammation of the meninges is secondary. Injecting a foreign substance into the slightly inflamed meninges sets up in most instances an acute aseptic meningitis, as is shown both by changes in the spinal fluid, and clinically by an increased temperature, headache, vomiting and rigidity of the neck.

It seems possible that this increased inflammatory reaction may tend to accentuate the inflammatory process already exist-

ing in the subjacent substance of the brain and cord. That this reaction may be harmful was further borne out by the results of animal inoculation, the treated animals showing a higher mortality and a more rapid death than the controls, in the majority of cases.

Poliomyelitis is a disease in which the prognosis is very uncertain. While great improvement seemed to follow the administration of serum in certain cases, equally great improvement occurred with no serum in at least an equal number of cases.

In view of these considerations the physicians of the meningitis division feel that the best treatment of early cases is complete rest, with lumbar puncture for the relief of pressure symptoms, in addition, of course, to general symptomatic and hygienic treatment.

It must be remembered that cases of meningeal involvement are comparatively rare in the experience of the general practitioner. We feel, therefore, that the meningitis work is distinctly worth while—first, in the aid it gives in diagnosing meningeal conditions and in treating meningitis; secondly, in the instruction given the physicians whom we see in consultation; thirdly, in training a group of experts who will be able to handle the outbreaks of poliomyelitis and meningitis that occur from time to time in New York City.

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TREATMENT OF CONGENITAL SYPHILIS—J. E. Smith (Canada Medical Association Journal, 1917, Vol. VII., p. 27) says that in congenital syphilis the prevention of cross-infection by means of the cubicle system is most important in order to reduce the mortality. This may be more efficiently accomplished outside by the supervision of all cases from a clinic, and the assistance of the visiting nurses. The greatest mortality is in the first six months so that early diagnosis and intensive treatment should be encouraged. Diarsenol offers the most efficient remedy from a therapeutic standpoint. The external jugular vein and the superior longitudinal sinus are the avenues by which the salt may be injected into the blood stream, so far without any untoward results.—*The American Journal of Obstetrics.*



## A CONTRIBUTION ON POLIOMYELITIS\*

BY WALTER LESTER CARR, M. D.

New York

During the epidemic of the summer of 1916, there were received at the City Hospital 63 children, sent by the Department of Health with the diagnosis of poliomyelitis. The final diagnosis for 5 of these were entered as follows:

1. Rickets, spinal fluid negative, signs and symptoms of poliomyelitis absent.
2. Enterocolitis, spinal fluid negative, signs and symptoms of poliomyelitis absent.
3. Normal child, spinal fluid negative, signs and symptoms of poliomyelitis absent.
4. Septic meningitis with multiple abscesses; decompression operation.
5. Staphylococcus meningitis, diagnosed at autopsy.

The remaining 58 cases, 30 males and 28 females, were poliomyelitis.

The youngest child was 3 months old, the oldest was 9 years, the average age being 3 years.

Of the 58 cases of poliomyelitis, 7 died and of these 7 cases 4 died within 48 hours.

Fifty-four cases were treated intraspinaly and 3 cases died, a mortality rate of 5.5% for the cases treated.

The 58 cases were classified as follows:

American, 12; Russian, 11; "Hebrew", 10; Italian, 9; American Negro, 1; German 6; Irish, 5; Austrian, 2; Hungarian, 2.

There were 2 instances of more than one case in the same family.

As the children came to the hospital from the Department of Health the primary histories were not always obtainable, but when intelligent histories were given the previous health of the patients was noted as excellent.

At the onset of the illness the children were feverish and complained of weakness of one or more extremities, with pain in the extremities, head or nape of the neck, and soon after became either very irritable or drowsy and irritable. One

\* Read before the Twenty-ninth Annual Meeting of the American Pediatrics Society, held at White Sulphur Springs, W. Va., May 28, 29 and 30, 1917.

child had convulsions. The first symptoms noted by the mothers of two patients was the baby's inability to cry aloud.

On admission the children were observed to be healthy and normal. Almost all of them were well nourished. They were irritable and hypersensitive. They disliked to be disturbed and would cry when moved, but their irritability did not come from the amount of paralysis. A case of facial paralysis would give all the characteristic symptoms of the disease and would be just as irritable when moved as one with more paralysis.

The tongue was usually coated with a yellowish white, the edges were red and the papillae prominent. Later, in a few cases, the coating was of a "war map" character. The tongue was tremulous when protruded. The pharynx and tonsils were reddened and swollen, and in some children the follicles were distended with secretion. Hypertrophied tonsils were recorded in 25% of the cases. There was inflammation with a mucous exudate in two cases. There was a nasal discharge in 22 cases. No child had had a tonsillectomy or adenoidectomy.

Clinically three types of cases were noted:

I—Very mild with a slight rise of temperature, with the neck a little stiff and painful but without any definite paralysis.

Illustrative Case. No. 35. Female. Age 2 years. Admitted August 11. No history. Well developed and nourished, membranes pale; tongue coated; throat congested; considerable mucus. Lymph nodes palpable, cervical, submaxillary and axillary. Heart and lungs normal. No temperature. Upper extremities, reflexes present but right increased; weakness of muscles. Lower extremities knee-jerk absent on right side; Brudzinski, Kernig and MacEwen absent. Face, paralysis of the right side. Spinal flexion sign negative but neck slightly rigid.

Spinal fluid clear; pressure negative; globulin +; Fehling +; cell count 2.

The following day no paralysis except of face. August 15—Spinal fluid clear; pressure increased; globulin +; Fehling +; cell count 8.

August 16—Spinal fluid clear; pressure increased; globulin +; Fehling +; cell count 51.

August 17—Spinal fluid clear; pressure increased; globulin +; Fehling +; cell count 37.

Blood count, 15,000 leucocytes. No temperature during the course of disease. Discharged September 27. No paralysis; reflexes all normal.

II—Very irritable and restless, or irritable and stuporous, one or more groups of muscles affected, weak or paralyzed, and reflexes absent, or in a few cases exaggerated.

Illustrative Case 18: Male. Age 3 years. Admitted August 11. Noticed to be ill August 8. "Blue around mouth"; enema given by mother. Became feverish, irritable and sleepy; lost speech. On admission well developed and nourished but looked ill and stuporous. Face flushed; macular and papular eruption; conjunctivae inflamed; tonsils enlarged; throat full of mucus, mucous membranes pale; enlarged lymph nodes in neck, axilla and groin; no paralysis but muscles weak. August 12, patient stuporous; exaggerated knee-jerks. August 15, biceps reflexes absent; knee-jerks exaggerated. Left facial paralysis and loss of speech. Temperature on admission 100.4; pulse 118; respiration 28. Temperature, August 10, 103.2; August 13, Temperature 103.6; normal on August 15 with a rise to 102 on August 16, after which there was a steady decline. August 12, Spinal fluid clear; pressure increased; globulin +; Fehling +; cell count 20. August 13, spinal fluid clear; pressure normal; globulin +; Fehling +; cell count 28. August 14, spinal fluid clear; pressure normal; globulin +; Fehling +; cell count 558. August 15; spinal fluid clear; pressure normal; globulin +; Fehling +; cell count 128; leucocytes 16,000; polymorphonuclears 86%.

Child discharged October 6; left facial paralysis. Knee-jerks greatly exaggerated.

III—Stuporous or comatose cases with marked general weakness and shallow, jerky respirations.

Illustrative case:—No. 21—Female. Age 2 years. Admitted August 17. No history. Well developed, poorly nourished child. Very irritable; tongue coated; poor teeth; pharynx congested; lymph nodes enlarged in neck, axilla and groin; lungs and heart negative. Knee-jerks absent; no Kernig; spinal flexion sign present. August 18, apathetic, legs paralyzed; no knee-jerks; August 19, shallow, jerky respiration; stuporous. August 20, coma. Respiration shallow, jerky; extremities flaccid. Child died. Temperature on admission 104°; fell to 100°.

August 18; 104° August 19; August 20, A. M. temperature 99.2°; terminal temperature 104°.

August 17. Spinal fluid clear; pressure increased; globulin +; Fehling +; cell count 57.

August 19. Spinal fluid clear; pressure increased; globulin +; Fehling +; cell count 16.

August 20. Spinal fluid clear; pressure normal; globulin ++; Fehling ++; cell count 96.

Gold 1222210000.

Muscular weakness was a symptom in most cases and children would fall when standing in their cribs. This symptom was seen early in the disease and did not always depend upon paralysis of the legs. Tremor of the legs, arms and hands was also observed. A peculiarity of this muscular weakness and tremor was its shifting character before the limit of the paralysis could be determined.

The reflexes in the early stage were variable—absent one day and present or even exaggerated the next day. Later in the course of the disease the reflexes in the affected muscles were absent. Spinal flexion pain was present in every type of the disease.

Appetite. Loss of appetite was observed in all the patients whether the onset was accompanied by gastro-intestinal symptoms or not. The loss of appetite continued during the fever and the active period of the disease.

Vomiting occurred in 10 and diarrhea in 4 cases. Constipation was noted in the majority of cases.

Lymph Nodes. The superficial lymph nodes were found enlarged in 90 per cent of the cases, but the posterior cervical ones were most prominent. As 25 per cent of the children had hypertrophied tonsils and adenoids, these may have had a previous enlargement of the cervical lymph nodes. It was difficult to detect enlargement of the mesenteric lymph nodes, although they participated in the general picture. The enlargement of the lymph nodes was an early symptom and its subsidence was co-incident with a lessening infection.

The eyes were dull and in some cases there was slight conjunctival congestion. The eyegrounds in 12 cases of the upper cord or cerebral type were examined with negative results.



In cases of the cerebral or bulbar type the pupils were less responsive to light than in the lower cord cases. Nystagmus was observed and also strabismus.

Ears. There was perforation of the membrani tympani and a discharge from the ear in two cases.

Skin. The skin was almost always normal but a few cases showed a papular or macular rash and one had sudamina. The extremities were often cold. The skin was irregularly cyanosed in the respiratory cases.

The temperature was variable and ranged from normal to 106° F. It was usually below 103° but varied considerably. Although the temperature was kept as part of the histories during the time the children were in the wards, it had no particular character after the fourth or fifth day and subsided with the disappearance of the more acute symptoms of the onset of paralysis unless there was a complicating disease.

Pulse. The pulse was frequently recorded as rapid and thready and showed irregularity and rapidity not associated with the temperature. This increased and irregular pulse rate was noted from time to time during the disease.

Lungs. A catarrhal condition of the bronchial tubes with rales was observed in 5 cases, but judging from the cases in the hospital there may be more than simple bronchial swelling and secretion, as in three cases pneumonia was present. The area was not large but the physical signs were characteristic and not like the edema and pneumonia of respiratory failure.

Kidneys. The urine was usually acid and many cases showed a trace of albumin. Two patients had albumin and casts. Acetone was detected but it did not seem to have any particular bearing on the severity of the disease.

No extended series of urinalyses was made but there was no typical urinary finding.

Blood. The highest leucocyte count was 40,000 and the lowest was 8,200, an average of 18,000. The average polymorphonuclear count was 55 per cent. The small lymphocytes averaged 34 per cent and the large lymphocytes 11 per cent.

Lumbar Puncture. Three hundred and fifty spinal punctures were performed. The spinal fluid, with few exceptions, was clear with slightly or markedly increased pressure. The

globulin was increased, becoming more as the disease advanced. Fehling's reduction was positive.

Before intraspinal treatment the highest cell count was 300 and the lowest cell count was 6; the average cell count was 36. The average differential count was lymphocytes—85 to 100%; small lymphocytes 70%; large lymphocytes 30%. As a rule the counts rose after treatment. The average cell count of four fatal cases was 44 for 8 counts.

Of the 51 fluids, upon which the Lange colloidal gold reaction was performed, but 2 exhibited the reaction of normal fluid. Low curves were the rule, the height of which increased as the disease advanced in intensity. The maximum decolorization was in the third, fourth and fifth tubes, the result in the curve being in the "lucetic zone", or zone II, in 70% of the cases.\*

Treatment. Bichloride of mercury, gr. 1/200 to 1/100, was given intraspinaly in sterile water, but was not repeated. Eight cases were treated without a death. Three of the eight did well, but in five cases convalescence was slow and the residual paralysis was marked in three cases.

Diarsenol was given the same as mercury and not repeated. In three cases treated there was no death.

Adrenalin chloride, solution 1-1000, was used alone in 16 cases with one death. Two c.c. of freshly sterilized solution was given intraspinaly and repeated two or three times a day as indicated. The indications for the use of adrenalin were:—

- 1—Respiratory involvement;
- 2—Stuporous and toxic cases;
- 3—High pressure of spinal fluid.

The results recorded after the use of adrenalin intraspinaly were:—

- 1—Deeper and less labored respirations.
- 2—Improvement in the quality of pulse.
- 3—Increased blood pressure; usually 10-15 points.
- 1—Pressure of spinal fluid on later punctures became normal.

\*Colloidal gold reactions were made by Dr. L. H. Cornwall, assistant pathologist at the City Hospital. He states that "Reaction offers but little aid in the differential diagnosis of anterior poliomyelitis during the acute stage, nor can it be relied upon for definite information of prognostic value."

Freshly prepared immune serum was used in 27 cases with two deaths. Both fatal cases were in coma on admission. Ten to 15 c.c. was given intraspinaly after allowing 10 to 30 c.c of spinal fluid to escape. The amount removed was regulated according to the pressure of the fluid. The injection was repeated two or three times at 24-hour intervals.

Adrenalin chloride, 1-1000, was given with the serum and repeated at 6-10 hour intervals in cases showing respiratory disturbances. In no cases were bad symptoms noted following their combined use. The results recorded indicate an especial benefit in the cardio-respiratory cases and a good effect on the circulation was noted in all cases where adrenalin was administered with serum.

The conclusion reached after using adrenalin either alone or with serum was, that while not a specific, its value was unquestioned in severe and toxic cases and in those of a fulminating type. The two preparations, immune serum and adrenalin, were the main-stay of the treatment.

Before the children were admitted to the hospital their care and treatment had been arranged for, as far as possible, in accordance with the requirements of the Department of Health. The wards were isolated and screened, the nurses and physicians wore gowns and antiseptic solutions were used.

On admission every child was examined, a spinal puncture was made and the character of the fluid recorded. The blood was examined and also the urine. The nose and throat were irrigated twice a day with normal salt solution. Colon irrigations were used and continued as a daily routine in the toxic and severe cases. Sponge baths were given for a temperature of 103° or over. Hot water bottles and cotton bandages were used for cold extremities. Light splints were applied as necessary but were removed from time to time, and after the acute period of the disease massage was inaugurated and given gently with great care. The children were kept very quiet and remained in the hospital over six weeks.

As the children showed loss of appetite early in the disease, feeding was not crowded; but when convalescence was established they were fed according to their individual needs. Breast fed infants were given formulae made from certified milk; and older children were fed according to age and digestive power. The in-

ordinate appetite, which has been mentioned by all observers, was seen in many of these patients.

Two cases of pharyngeal involvement were fed by gavage and by the rectum. It is satisfactory to note that both cases recovered.

Medicinal treatment was largely symptomatic. Many of the children were given calomel on admission. Sedatives were used as necessary to quiet restlessness and to relieve pain. Sodium bromide, antipyrin and codein were the drugs usually administered.

Urotropin was given to patients whose symptoms indicated kidney or bladder infection, but it was not made a routine treatment. Camphor, caffein, strychnin and oxygen were used as indicated but the method was not different from that employed in pneumonias or other exhausting conditions.

#### Autopsies.

Dr. John H. Larkin, pathologist to the City Hospital, in charge of the Strecker Memorial Laboratory, states his conclusions of the autopsy findings in poliomyelitis as follows:—

“I have been able to divide the cases coming under observation, into three classes:—

1—The cerebral bulbar type of the disease, the severer cases of which show a rather acute brain swelling, the brain (both the gray and white matter) being of a light bluish copper color. This peculiar color and swelling of the brain I have not encountered in any other acute infectious disease, and is observed, as above stated, in only the severer types of the cerebral cases. The gray and white matter take on a uniform bluish copper color and there are numerous petechial hemorrhages scattered throughout the brain substance. In other words, the lesion is one of acute encephalitis.

The cord in these cases usually show, especially in the upper cervical and lower lumbar, a marked swelling of the anterior horns, and also hemorrhages of varying degree, the dorsal cord however, escaping any macroscopical lesion.

2—Other cases of the cerebral bulbar type show an absence of brain swelling, absence of the bluish copper color with a simple overdistension of the pia arachnoidal vessels, being unaccompanied by any macroscopical evidences of encephalitis. The lesions in the cord, however, usually give the picture of swelling



of the anterior horns, with hemorrhages in varying degree. This may continue throughout the entire length of the cord.

3—In this class of cases the lesions are confined to the cord alone, either to the lower lumbar, mid-dorsal or any of the segments in the cervical region. Here the macroscopical lesions vary; in some cases none being distinguishable, others showing swelling of the anterior horns and hemorrhages in varying degrees of intensity.

The cases which die rather rapidly show very little alteration in the abdominal viscera, except in the large and small intestines, where there is the usual follicular enterocolitis, showing, in moderate cases, a simple hyperplasia of the lymph nodules and usually accompanied by an unusual hyperplasia of the mesenteric lymph nodules. This has been a constant observation in all of the autopsies I have performed: a general hyperplasia of the mesenteric lymph nodules and an accompanying follicular enterocolitis, in some cases leading on to distinct ulceration. The lymph nodes throughout the body may otherwise be moderately hyperplastic, such as those in the axilla and in the groin. The other cases observed were those dying of a secondary bronchopneumonia, or a confluent lobular pneumonia; others disclosed the conditions which one observes in a severe toxemia with acute parenchymatous changes in the viscera."

The residual paralysis on discharge of patients were:—

Lower extremity .....	23
Upper extremity .....	5
Facial muscles .....	10
Back muscles .....	8
Shoulder muscles .....	2
Thoracic muscles .....	1
Diaphragm .....	1
Pharynx .....	3
Larynx .....	3
Ptosis, both eyelids .....	1

The 51 patients discharged may be classified as follows:

6 cases with marked paralysis; very little improvement.

33 cases with slight weakness of one or more groups of muscles; daily improvement.

12 cases with no paralysis nor weakness of any muscle.

I believe the cases did well:—

First—Because of the quiet and nursing that the children received at the hospital, which would have been impossible for most of them at home.

Second—That immune serum and adrenalin lessened the severity of the symptoms.

It is not yet possible to judge of the statistics of any one plan of treatment, and it may be that lumbar puncture alone has a therapeutic effect which will be determined only after a careful analysis of the many groups of cases under different lines of treatment during the epidemic of 1916.

Credit should be given Dr. A. J. Ellington and to the physicians of the house staff at the City Hospital, who, with the nurses, worked untiringly. Dr. K. N. Bostanian, of the Pediatric division, has studied the records and made notes of the histories of this report.

68 West 51st Street.

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A CASE OF EPENDYMITIS IN A CHILD ("New York State Journ. Med.," 1916, xvi, p. 148).—A. C. Snell and J. Raby report this case in a boy, aged 11 years. The diagnosis of ependymitis was made: 1.—Because the symptoms present were those described by Delafield. 2.—Because tuberculous meningitis was ruled out thus: (a) Patient lived; (b) cell count too low; (c) no tubercle bacilli found; (d) negative von Pirquet. 3.—Because syphilis was ruled out thus: (a) Negative Wassermann on blood and spinal fluid; (b) no evidence of clinical history of it. 4.—Because the eye conditions evidently were caused by pressure of the fluid, as the subsequent improvement after tapping proved. 5.—Because there was no evidence or clinical history of any of the acute exanthemata or of typhoid fever. The point of particular interest in this case was the fact that a single lumbar puncture was directly followed by a complete cure of all symptoms with full preservation of perfect visual acuity. The preservation of perfect vision was due in large measure to the early diagnosis, and to the prompt relief of the intra-ventricular pressure, which had not remained for sufficient time to cause secondary changes within the eyeball.—*The British Jour. of Dis. of Chil.*

## MACROSCOPIC AND MICROSCOPIC FINDINGS IN POLIOMYELITIS

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Macroscopic examination of a series of cases of poliomyelitis at autopsy included examination of the brain, cord and membranes. Microscopic examination included the cord, ganglion cells, interstitial changes in the anterior horns, pons, peripheral nerves and the internal viscera. For such study all tissues were hardened in formalin; embedded in paraffin and stained by several methods; namely, hematoxylin, eosin, Giemsa, Van Geason, Nissl and other selective stains; special stains for fat, including Marchi, Sudan III and Scharlach R. Frozen sections were made of tissue from all cases.

The gross appearance of the brains in the cases examined was not at all characteristic of the lesion. It can be said, however, that in one case of the fifteen the brain tissue seemed to distend the dura mater, so much so as to produce a distinct softening of the convolutions, and upon more minute examination the color of the pia was found to be of a distinct copper-blue color.<sup>1</sup> The brain tissue was soft and somewhat edematous in this case. There were no distinctive gross lesions to be made out in the brain tissue of the other cases, except that in some there appeared to be a distinct edema, which was more prominent in the sulci. Examination of the brain at various levels, outside of the edematous condition referred to, which involved both the gray and white matter of the brain, gave negative results.

Macroscopic examination of the cord revealed very varying pictures as regards the levels most involved. In the more typical cases, in the upper cervical region, in the position of the anterior horns, a distinct reddish-pink color stood out in sharp contrast to the white matter of the cord, somewhat simulating the letter H. In this region the tissues seemed to be depressed below the level of the white matter; the horn seemed to be distended. There were no evidences of distinct hemorrhages at the levels. Sections below the upper cervical and the various dorsal and lumbar segment showed no gross anatomical change. Distinct soften-

1. The case of Annie Martincowitz, noted in Dr. Walter Lester Carr's paper, is illustrative of the stuporous or comatose type.

ing in some areas was made out. These were sometimes unilateral and sometimes bilateral.

GROSS EXAMINATION OF MEMBRANES—No distinctive changes could be observed in the dura mater. Upon removing the dura and minutely inspecting the pia it showed, in the majority of the cases, an edema without any noteworthy changes. This edema seemed to infiltrate into the sulci. In one case, which is described above<sup>2</sup>, the pia mater showed enormous capillary distention, but without the appearance of free blood in the interstices of the pial membrane. This engorgement seemed to be entirely venous. There was no evidence of acute leptomenigitis observed in the cases examined.

Examination of the spinal meninges showed no gross macroscopical alteration. In some cases there was a slight accumulation of serum with moderate distention of the blood vessels in the meninges, but this was not a constant condition.

MACROSCOPIC EXAMINATION OF VISCERA—The majority of the cases showed more or less macroscopic evidence of bronchopneumonia. Macroscopic examination of the hearts in all cases proved negative. No gross alterations were found in the stomach, pancreas, kidneys or adrenals.

In all cases examined there was a regular lymphatic hyperplasia of the mesenteric lymph nodes, the measurements of some reaching from one to one and one-half cm. in diameter, and on cross section were deep red in color; some were hemorrhagic and edematous. This was a general and constant finding in all cases.

Upon inspection of the gastro-intestinal canal there was regularly found an hyperplasia of the solitary lymph nodules, and Peyer's patches in the region of the ileocecal valve showed intense hyperplasia, but in none of the cases had actual ulceration occurred.

Macroscopic examination of the spleens showed enlargements, and upon transection revealed a distinct hyperplasia of the Malphigian bodies. The splenic pulp was not edematous, and the consistence of the organs was firm. Examination of the muscular structure of the bodies showed no gross alterations. Macroscopic examination of the bone marrow, likewise, showed no distinctive alterations.

2. Dr. Walter Lester Carr's case of the comatose or stuporous type.



**MICROSCOPIC EXAMINATION**—Microscopic examination included the brain, cord, membranes and spinal cord at different levels; also the changes in the ganglion cells, interstitial changes in the cord, examination for the presence of hemorrhages and such changes as may occur in the pontine region, as well as microscopic examination of the internal viscera, the musculature and bone marrow.

No distinctive changes could be observed in the dura. In the pia the changes were those of edema and inordinate venous engorgement, but without distinctive hemorrhage into the tissues. Minute examination of the pial meninges failed to show any distinctive microscopic alteration.

**MEMBRANE OF THE CORD**—In the milder cases of the series the pia mater of the cord showed a normal histological picture, while in the more severe cases the blood vessels of the pia mater were the seat of a perivascular cell accumulation, often more marked in the cervical region, where the corresponding changes in the gray matter had occurred. At other levels the pia mater showed no extensive alteration. In those cases in which perivascular cell infiltration had occurred to a marked degree, the same perivascular infiltration had extended in and around the blood vessels in the ventral fissure. The character of these cells was that of a small, round mononuclear cell, having a round or oval nucleus, and looking not unlike a lymphocyte. No evidence of polymorphonuclear leucocytes were to be observed, but occasional plasma cells were seen mixed up with these mononuclear cells.

**CORD**—Examination of the cords revealed varying pictures when taken from different levels, from the cervical to the lumbar region. It is noteworthy that the more exaggerated pictures were confined to the cervical regions, and here the changes were of a variable character, and will be described under three heads; namely: First, vascular changes; second, ganglion changes, and third, interstitial changes.

The vascular changes gave a varied picture in the cases examined, and at the levels where the lesion was most marked no distinctive microscopic hemorrhages were to be found. On the contrary, the more severe cases showed an engorgement of the blood vessels in the anterior horns, and were regularly surrounded by collections of small round mononuclear cells, sometimes six and eight rows deep. The lumenae of the vessels

were not impinged upon, despite the fact of excessive perivascular infiltration. The accumulation of these cells seemed to be in the adventitia of the blood vessels. The character of the cells were altered by pressure, as well as the nuclei. The nuclei were overstained and closely packed together. No polymorphonuclear leucocytes could be made out from a most minute examination.

A rather noteworthy microscopic appearance in a number of the cases examined was the island collection, apart from the blood vessels, of small round cells, closely packed together and replacing the gray matter at this point. Such island collection of cells were, at some levels, exceedingly numerous. The character of the cells were not unlike glia cells, and in the numerous sections examined it was quite evident that softening of the cord at such levels was occurring and had occurred at other levels, in which distinct softening and vacuolation of the gray matter had occurred, leaving irregular, round open spaces. These vacuolated spaces were of such microscopic character as to be readily distinguishable from artifacts of the nervous tissue. The character of the cells at different levels in the cases examined seemed to the writer to be a distinctive cell, which belongs to the glia type in such regions, resembling it in shape. Outside of the perivascular accumulations apart from the tissue of the blood vessels on the aforesaid island glia accumulations, there were other cells which were mostly of a polyblastic character, in which the nuclei stained distinctly, the outline of the cells being prominent, but the protoplasm not taking on the eosin stain. In such sections the architecture of the horn, whether the lesions were unilateral or bilateral, was entirely lost and replaced by such accumulation of polyblastic cells. These cells, however, I consider only a variety of glia tissue. The microscopic changes had not only occurred in the anterior horns, but were, in some cases at some levels, quite as extensive in the posterior horns.

Microscopic examination of the ganglion cells in the anterior horns at different levels showed all grades of degeneration from that of slight injury to entire disappearance of their nuclear and protoplasmic substance, leaving, in the areas most degenerated, well-staining ganglion cells showing a regular arrangement of their chromatic bodies. The microscopic study was closely confined to the ganglion cells at different areas, and in these there was found a degeneration of a very marked degree. The lesion

in the ganglion cells from the cervical to the conus was marked by a degeneration of variable character, and involved not only the ganglion cells of the anterior horns, but those of the posterior horns and throughout the dorsal cord of the columns of Clark, as far down into the lumbo-sacral enlargement as the nucleus of Stillings. It was quite apparent, on account of the degenerations at different levels, that one might attempt a count of the ganglion cells in the various levels from the seventh cervical downwards, and to compare them with the approximated number of normal cells found therein one would find that the average number of normal cells left in the region most degenerated were about 10 per cent. Fully 90 per cent. showed the varying degrees of degeneration herein described. Nearly every grade of chromatolysis was observed, peripherally, centrally; and, in some places, perinuclearly. The predominating type was the well-known central chromatolysis so characteristically observed in axonal degeneration. In a great many of the cells (perhaps 40 per cent. of them) at regions most involved the chromatolysis had advanced to a degree of complete loss of stainable substance, and even to complete cell destruction. The loss of nuclei of many cells was noted, only a shadowy outline of the cytoplasm, containing a light, granular-staining substance being left. In other cells the nuclei seemed to be eccentric. This was the predominant condition in many of the sections examined at different levels in the most exaggerated areas of destruction. Eccentricity of nuclei, especially in the cells of Clark's column, with a central chromatolysis was a prominent feature. Many of the cells, however, contained a fairly normal cytoplasmic staining of the reticulum of the cell, with lightly colored dust-like particles. No vacuolation of the cells at any level was observed. Marked degeneration in one horn, as compared with the opposite horn of the several areas involved, showed extreme destruction of the anterior horn on one side, with only a comparative lessening of the microscopic changes in the corresponding horn on the other side.

Changes in the cyto-reticulum of the nucleus were manifest in most of the levels, though this part of the cell structure seemed more resistant than the structures of the cytoplasm. There was, however, no nucleolar variations or fragmentations occurring. Stress, however, must be made on the normal characteristic cells

of Clark's column, it being well known that they contain fewer chromophilous bodies, and when such degenerations occur, it is easy for one to misinterpret the lesions found in this column. When such extensive degenerations of the ganglion cells occur in the anterior horn there necessarily occur marked peripherally interstitial changes, cells which are variable in amount and in their microscopic character. The microscopic examination of the interstitial changes therein may be summarized as follows:

**INTERSTITIAL CHANGES**—Here again the interstitial changes varied in proportion to the destructive lesions occurring in the ganglion, which was also marked at the different levels of the cord involved. These interstitial changes varied in amount from that of cell proliferation of small round cells to the most excessive accumulation of glia and polyblastic cells. In the milder degenerations the interstitial changes varied from a diffuse proliferation of small round glia cells to a peri-vascular involvement of the blood vessels in the anterior horn and an extensive replacement of the anterior horn by excessive island accumulations of small round plasmoid or polyblastic cells, as well as to extreme replacement of the whole anterior horn, either unilateral or bilateral, with characteristic cells belonging to the glia type. The mononuclear cells around the blood vessels seemed beyond the adventitia, and though variable in amount, had little or nothing to do with the occlusion of the vessels therein, though the cells themselves were altered by pressure. The island accumulation of glia cells, with their dark-staining nuclei, was a characteristic feature in a number of the levels examined in the more severe cases, and it could be made out that such cells were in the process of disintegration, leaving a tissue light in structure and evidently disintegrated, in places leaving vacuolated areas in the different levels of the anterior horn. Such microscopic changes were not, however, noted in the posterior horn. In some regions of the cord an entire replacement of the ganglion cells was apparent. There was a replacement by accumulations of coalescent cells, polyblastic in type, but of evident neuroglial origin. These cells were especially abundant in some areas, but were absent in others. The interstitial changes in the posterior horns were notably diminished, as compared to the changes in the anterior horns. No evidence of leucocytic infiltration was observed in any of the sections examined from both areas.

**HEMORRHAGE**—Microscopic examination of sections from many different levels showed a complete absence of hemorrhage.



The blood vessels in the anterior horns in many sections were enormously distended with a perivascular unsheathing of lymphoid cells, but in no wise diminishing or compressing the lumen. Rather curious pictures were observed in the adventitia of the blood vessels of the white matter of the cords throughout, the blood vessels having been pressed off to one side, leaving a clear-staining area, which, with thionin stain gave a blue appearing substance. This I consider an edema in the perivascular sheath, but has little or no significance. There were no noteworthy changes in the white matter of the cords at different levels. The varied changes noted by other observers are not in keeping with the present findings, it having been reliably established that focal cellular accumulations in relation to the blood vessels have occurred in some cases, but which are notably absent in others, and is of minor importance.

The changes in the pons in those lesions giving clinical pontine symptoms are of the same microscopic character as those described in the cord of the case described above,<sup>3</sup> varying in relation to the intensity of the disease. Microscopic examination of the posterior nerve roots at different levels showed, in some cases, lightened areas, which seem to the writer to be focal areas of degeneration. These were of such variable character, however, that no great importance can be attached thereto.

Examination of the peripheral nerves in those cases showing paralysis of the extremities were made by osmic acid, and fresh teased specimens of such nerves observed. The variability of the degeneration of the myelin in the cases of long standing showed degeneration of the nerve fiber with fragmentation of the myelin, and the heaping together of round, black globules stained by osmic acid. Microscopic examination by Marchi's method of staining such nerve fibers has, as yet, not been completed, but it is evident from examination of such teased nerves that more convincing results will be observed of such degeneration.

Microscopic examination of sections of the viscera proved negative, except where macroscopic changes had occurred in the gastro-intestinal canal, the mesenteric lymph nodules and the spleen. In a number of cases examined by other observers the liver was said to be the seat of focal accumulations, replacing the liver cells in that area in and around the vicinity of the central vein, the cell making up this focal necrotic zone being

3 Dr. Walter Lester Carr's case of the comatose or stuporous type.

reticular in type and containing many dust-like granules of nuclear material. Such microscopic changes in the liver are difficult to find.

The microscopic examination of the mesenteric lymph nodes showed a characteristic hyperplasia with edema and congestion of lymphatic structure. The perilymph sinuses were distended with large vacuolated cells containing debris. Injection of the blood vessels was well marked and the lymph nodules as a whole markedly hyperplastic. The same alterations of a hyperplastic nature were made out in the solitary lymph nodules in the colon, and also in Peyer's patches in the small intestine throughout, giving a characteristic microscopic appearance of intense hyperplasia. No noteworthy changes were observed in the kidneys, except for an early parenchymatous swelling of the tubules.

Examination of different areas of the brain and meninges and spinal cord and meninges at different levels, appropriately stained for organisms, gave regularly negative results.

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CONGENITAL FAMILIAR PARAMYOTONIA. EULENBURG'S DISEASE (*'Paris Méd.'* 1916, vi, p. 468).—A. J. Rayneau and A. Boutet record a case in a soldier, aged 38 years, of this condition, which consists in a transitory muscular rigidity occurring under the influence of cold and damp. His paternal great-grandmother, grandfather, father, two or three aunts, two brothers, and two of his three children, a girl, aged 10 years, and a boy, aged 8 years, showed the same phenomenon in different degrees. The muscles affected were the flexors of the fingers, interossei, and certain muscles of the thenar eminence, as well as the superficial facial muscles, and in a less degree the orbicularis oris and zygomatici. At intervals the masseter and quadriceps cruris were affected for a very short time and in a very slight degree. The symptoms first appeared at the age of 6 to 8 months. At first the muscles of her face alone were affected; but later, when the child began to make more use of her hands, the hand muscles also became involved. None of the muscles showed any hypertrophy. The dominating feature in all was the part played by cold in the production of the symptoms, except in the case of the second child, in which they appeared in the limbs without any change in the external temperature.—*The British Jour. of Dis. of Chil.*

## THE CARE AND FEEDING OF THE PREMATURE INFANT

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This paper aims at giving a practical idea of the care and feeding of premature infants and of the results obtained from the methods adopted in the infants' ward at the Burnside Hospital, Toronto.

**NUTRITION**—The problem of nutrition in these young infants is made doubly difficult by a great demand for food and a poor supply. The demand for food is relatively great because of the increased heat loss of premature infants. In proportion to its bulk the little body has a large surface from which to radiate heat. In addition, the layer of non-conducting fat is thin and the heat regulating mechanism inefficient. To balance this unusual food need there is only a feeble and under developed digestive apparatus, inferior to that of the normal infant. The ordinary infant needs less food yet can use more. Hence the double difficulty.

The prognosis of the nutritional result depends on the cause leading to the prematurity. Children of healthy parents who are prematurely born because of some external reason (twin pregnancy, trauma, etc.) and who show no difference from the normal except backward development present no greater nutritional difficulties than the normal newborn child. It is entirely different, however, when the prematurity is due to some constitutional weakness of the mother (especially lues). Here the constitutional condition is a grave complication to the prematurity. It is self-evident that the possibility of life depends upon the degree of development as indicated by the weight and length

of the child. The following table from Pfaundler illustrates this point.

Premature	Age	Length	Mortality the first two weeks of life
2 pounds 3 ounces	6 months	13 $\frac{3}{4}$ inches	95%
2 pounds 10 ounces	6 $\frac{1}{2}$ months	13 $\frac{3}{4}$ inches	82%
3 pounds 0 ounces	7 months	15 $\frac{1}{2}$ inches	65%
3 pounds 10 ounces	7 $\frac{1}{2}$ months	16 $\frac{1}{2}$ inches	42%
4 pounds 15 ounces	8 months	17 $\frac{3}{4}$ inches	20%

If good nursing, thriving premature infants are allowed to nurse the breast it will be found that the figures showing the caloric value per pound ingested from the tenth day of life will be more than 45 calories the usual figure for normal infants. Thus Oberwrath found the average quantity of milk taken by 33 premature infants, measured at 51 different periods during the first 3 months, to be 63 calories per pound of body weight. Birk calls attention to the fact that the normal child receives enough from the breast to satisfy its need, but not so the premature child. They take too much especially on an easy, free-flowing breast. The amount taken by the premature child does not indicate the nutritional need, but rather an over-consumption. The average premature child takes on the second day of life approximately 5 ounces of breast milk; this quantity is gradually increased each day by about 1 ounce till at the end of the tenth day it is taking about 10 to 11 ounces in the 24 hours.

There is no doubt concerning the type of nourishment on which the premature child can be pretty certain to live and thrive. The premature child should have mother's milk. To be sure the technique can be exceedingly difficult when combined with the under-development of the child. We find that it is a weak nurser and cannot stimulate the breasts to secrete. Then it is possible only with the help of a breast pump to bring about lactation; this also is insufficient and is difficult to carry out in the home. Then it becomes necessary to allow another child to start the breasts secreting and to continue the secretion while the premature child is to be fed with expressed or pumped mother's milk; or for the time being, a wet nurse with her child can be secured. On the easy, full breast, the premature child can soon learn the process of actively obtaining milk, while the wet nurse's child can start the flow from the other breasts. In favor-



able cases the energy of the mother alone can bring results, *i.e.*, when she persists and nourishes her child with the expressed milk until it learns to obtain it in the usual way. As long as the child does not take from the breast it must be fed expressed mother's milk either from the bottle or introduced with a premature feeder or pipette through the mouth. Children who are unable to drink must be fed through a stomach tube. If the children sleep uninterruptedly they should be spanked or sprinkled with cold water just previous to feeding.

Opinions differ concerning the number of meals required and the interval of feeding, and owing to the diversity of opinion this point is by no means settled. The method employed by us has been adopted from observations extending over 2 years, in which these infants on the various intervals have been closely followed. The average premature infant is thus fed every 3 hours for 8 feedings in the 24 hours and if it can be demonstrated that the baby is showing symptoms of dyspepsia (vomiting and green stools) it is fed less often, *i.e.*, every 4 hours, on which schedule it has been shown, the infant will obtain less food per nursing. The 2-hour interval we do not consider necessary and the results obtained are not so uniform as those on the 3-hour interval as has been shown by weighing experiments.

Artificial nourishment of the premature child is always a risky experiment. The weak organism often will be unable to develop on the food. Nutritional disturbances are frequent and in these cases form a severe complication. The first diarrhea of the premature child must be considered a severe disturbance and treated accordingly.

Results have been reported with all kinds of mixtures; fat-poor carbohydrate rich food; fat-rich carbohydrate poor mixtures; buttermilk; diluted and undiluted cow's milk and predigested milk. The caloric need is as high in using these mixtures as it is in using mother's milk (60-65).

Because of the greater body surface and immature heat regulation, care must be taken that energy loss through heat dissipation (activity, radiation, water loss), must be reduced to a minimum. This is accomplished by means of an incubator at a temperature of 80° to 85° F. or something devised to keep the child's temperature up to normal.

Absence of fresh air was a disadvantage in an enclosed incubator that even properly regulated heat did not outweigh.

The small enclosed incubator truly may be said to have died of suffocation. The incubator employed at the General Hospital is one modeled after that in the Babies' Hospital in New York and consists of glass partitions 4 feet high separating the cubicles. The temperature is 80° to 90° F. with an abundant supply of fresh, moist filtered air. The window is kept darkened. Equally important with heat and ventilation is the rigid exclusion of all persons from this room except the nurse in charge who must wear a separate gown when in the room and to be free from respiratory infection of any description. Under ordinary circumstances even the physician does not enter the room, but makes his routine inspection of the child held up to the glass door. The reason for these precautions is the great susceptibility of the premature infant to respiratory infections, to which he falls an easier victim than even to nutritional disturbances. In the home the danger of parental infection is great and this danger is multiplied in institutions. Thus it is that up-to-date institutions are adopting the system of cubicles or glass partitions in order to isolate each child so minimizing the risk of respiratory infections. Could this scourge be abolished fully 75% more children would be saved.

Most physicians are not interested directly in the construction of premature rooms with such refinements as glass cubicles and filtered air; but any practitioner is liable to be faced with the problem of devising a household expedient for the same. The following home-made incubator can be constructed with materials ready to hand in a short time and at a trifling cost. Take a 24-inch wicker clothes-basket and pad the bottom with non-absorbent cotton to a depth of 8 inches. On top of this cotton fit a sheet of oilcloth, sewing the edges through the sides of the basket. On the oilcloth lay a double layer of white flannel and on the flannel a napkin of absorbent cotton. Take half a dozen of 12-ounce citrate of magnesia bottles with wire and rubber corks and cover them with flannel. These bottles are filled with water at 110°F. and hung on the inside walls of this basket. A thermometer hung inside should register a temperature from 80° to 90° F. all the time. At night an oilcloth is spread over the foot half of the top of the basket. The child is bathed as previously described and wrapped completely in two layers of cotton flannel with an intervening layer of non-absorbent cotton. This garment covers completely the head, trunk and limbs only the

face and buttocks being left uncovered. The under-pad of absorbent cotton makes a diaper superfluous and the child is less disturbed by changing. The environment of the basket should follow as closely as possible that described for the premature room.

By the end of the first year a certain number of the premature children have made up the deficiency due to prematurity so there is hardly any difference between them and normal children. Others require 2 or 3 years, while not a small percentage of cases carry the stamp of prematurity for many years. This is shown in 3 ways: First, greater susceptibility to attacks of sickness. Second, disturbances in the bony and hemopoietic systems. Third, disturbances in the nervous system in general.

The lessened immunity can be explained by the smaller quantity of certain immune substance in the body or by an immaturity of the organs which manufacture it. The anemia is absolutely due to an insufficient iron deposit. It is known that the storing up of iron is accomplished the last 3 months of pregnancy; analogously, the pathologic conditions of the bony system (softness, disposition to rickets is due to a lessened deposition of calcium phosphate); both phosphorous and calcium being stored toward the end of pregnancy. The disturbances of the nervous system can also be accounted for thus, and may be due to an insufficient mineral deposit. It is self-evident that in the pathology of these conditions an insufficient development of nerve centers and tracts play a part.

The physician must keep in mind the possibility of the development of these conditions when treating a premature child. It is within his power to dietetically treat, alleviate or cure these conditions.

To increase the immunity there is no other method that we know of except the use of mother's milk. For the prevention of anemia we must at an early date add foods rich in iron, fruit juices and small quantities of vegetables. Anemia which is already present (not all paleness is anemia) can be quickly helped by using iron. From the fourth month on it is wise to begin the use of codliver oil and phosphorous in order to increase the calcium retention.

RESULTS. BURNSIDE HOSPITAL, TORONTO.—1—Number of cases treated. The total number of cases treated from August,

1914, to September, 1916, was 68, and of these, 45 cases were followed for 1 year.

	WEIGHTS.	lbs.	oz.
Average birth weight (all cases).....	3	11½	
Average birth weight (died under one year).....	3	10	
Average birth weight (survived one year).....	4	3	
Lowest birth weight (survived one year).....	2	7	
Highest birth weight (survived one year).....	5		
Average initial loss (all cases).....		6½	
Average initial loss (survived one year).....		7	
Average initial loss (dead under one year).....		6¾	
Average gain in hospital (survivors only).....	1	7	
Greatest gain in hospital (patient in 14 weeks)....	3	13½	

Note. Child weighing more than 3 lbs. 14 oz. at birth will probably live; under that probably die.

#### FEEDING ON DISCHARGE.

Breast milk.....	31
Modified cow's milk.....	30
Mixed feeding.....	3

#### STAY IN HOSPITAL.

Average of survivors.....	8 weeks
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#### INFANTILE COMPLICATIONS NOT CAUSING DEATH.

Convulsions .....	1
Pyloric Stenosis.....	1
Idiocy .....	1
Secondary anemia.....	1

#### MATERNAL COMPLICATIONS.

Eclampsia (one mother died).....	9
Toxemia .....	4
Syphilis .....	2
Insanity .....	2
Nephritis .....	2
Chorea .....	1
Pernicious Vomiting.....	1
Intestinal Obstruction.....	1
Gonorrhea .....	1
Placenta praevia .....	1

These complications did not affect the infant mortality to any degree.



No. of Case	Birth Weight	Initial Loss	Lowest Weight	Highest Weight	Gain in Hospital	Weeks in Hospital	Feeding on Discharge	Maternal Complications	Infantile Complications	End Results
1	lb. oz. 3-15½	oz. 4½	lb. oz. 3-11	lb. oz. 6- 3	lb. oz. 2- 3½	10	Artificial	Chorea		A. and W. 1 year
2	4- 3	8½	3-10½	6- 0	1-13	12	Artificial	Eclampsia		A. and W. 1 year
3	3-13	8¼	3- 4¾	5-11¾	1-14¾	12	Artificial			Unknown
4	4-11	7	4- 4	5- 4	0- 9	6	Artificial			Unknown
5	4-14¾	9¾	4- 5	—	—	2	Breast			A. and W. 1 year
6	5- 0	12	4- 4	6-14¾	1- 4¾	11	Artificial			Unknown
7	3-15½	10	3- 5¼	4-13	0-13¾	9	Artificial			D. 2½ months Home condition poor
8	3-12½	4½	3- 8	4- 9	0-12½	6	Artificial			A. and W.
9	4- 4	12	3-14¾	—	—	2	Breast		Mongol. idiot	D. 7 months Bronchopneumonia
10	4-13½	11½	4- 1¾	5- 3¼	0- 6	8	Breast			A. and W. 9 mos.
11	5- 0	6¾	4- 0¾	5- 1¾	0- 1¾	6	Breast	Eclampsia		Unknown
12	3- 8	5	3- 3	6- 0	2- 8	18	Artificial			D. 5 months
13	3-14¼	13¾	3- 1	5- 4½	1- 6½	12	Breast			A. and W. 1 year
14	3-15¼	6¾	3- 9	5-10	1-10¾	8	Artificial			Unknown
15	3- 5½	4	3- 1½	5- 5	1-15½	8	Artificial			D. 8 months Gastro-intestinal
* 16	2- 7	4½	2- 2½	6- 3½	3-12½	20	Artificial	Eclampsia	Transfusion at 7 months	Died 1 year
17	4- 5¾	11½	3-10½	4-12	0- 6¾	5	Breast			A. and W.
18	4- 5¾	6¼	3-15½	4-10½	0- 4¾	4	Artificial			D. 6 mos., measles
* 19	3- 1¼	3¼	2-14	4-15	1-13¾	11	Artificial		Mongol. idiot	A. and W.
20	4- 2¼	4¼	4-14	4- 4¼	0- 2	2	Breast	Eclampsia	Gastro-intestinal	D. 9 months
21	5- 0	9¾	4- 6¼	6- 1¼	1- 1¾	8	Artificial	Heart and kidney	Convulsions	A. and W. 11 mos.
22	3-12½	11½	3- 1	6-12	2-15½	13	Artificial			A. and W. 1 year
23	3-11½	4½	3- 7	5- 1½	1- 6	6	Breast	Toxemia		Unknown
* 24	2-10	4¼	2- 5¾	4-13½	2- 3¾	9	Breast	Toxemia		After 2 months
25	4- 5	6	3-15	4-15½	0-10½	5	Breast			A. and W.
26	4- 9	5¾	4- 3¼	8- 4	3-11	14	Artificial	Eclampsia	Twins	A. and W.
27	4- 4	5	3-15	8- 1½	3-13½	14	Artificial	Eclampsia	Twins	A. and W.
28	4- 8	8	4- 0	4-12¼	0- 4¼	3	Breast			Unknown
29	4- 9¾	12¾	3-13	5- ¾	0- 7	5	Breast	Twin		A. and W.
30	4- 7	9¼	3-13¾	5- ¾	0- 9¾	5	Breast	Twin		Unknown
31	4- 9½	4½	4- 5	5- 2½	0- 9	3	Breast			A. and W. 1 year
32	4- 2	6½	3-11½	5- 5½	1- 3½	5	Mixed	Eclampsia	Pneumonia	D. 4 mos., pneum.
33	4-14¼	9½	4- 5	5-10½	0-12	6	Mixed	Twin		D. 6 months
34	4- 2	6	3-12	5-11½	1- 9½	9	Artificial	Twin		Cause?
35	4- 0	8	3- 8	6- 6	2- 6	13	Artificial		Hemic and pyloric stenosis	A. and W. at 3 mos.
* 36	5- 0	5	4-11	5- 0	0- 0	12½	Breast			Unknown
37	3- 0	5	2-11	4- 1½	1- 1½	8	Mixed	7th month, eclampsia		A. and W.
38	4- 3	3	4- 0	4- 9½	0- 6½	1½	Breast	Toxemia		A. and W.
39	3- 1¼	8¾	2- 8¼	—	—	—	Artificial	Twin No. 16	Atelectasis, icterus, neonatorum Jaundice	Basal hemorrhage Died 3 days
40	3- 0	8	2- 8	—	—	—	Artificial	Pernicious		D. 1 week
41	4- 8	7	4- 1	—	nil	2	Breast	Twins		Unknown
42	3-12	9	3- 3	4- 1½	0- 4½	4	Breast	Twins		Unknown
43	3-12	4	3-11	—	nil	2	Breast	Insanity		Unknown
44	4- 8	5¾	4- 2¼	5- 2	0-10	7	Artificial	Gonorrhea		Unknown
45	3-13¾	—	—	—	—	—	Artificial		g. c. ophthalmia	D. 17 days
46	2- 7	—	—	—	—	—	.....	Nephritis	Pneumonia	D. 8 hours
47	2- 4½	—	—	—	—	—	.....		Atelectasis	D. 4 hours
48	2- 9½	9½	2- 0	—	—	—	Artificial		Atelectasis	D. 1 week
49	2-10½	—	—	—	—	—	Artificial		Atelectasis	D. 2 days
50	4-12	—	—	—	—	—	.....		Atelectasis	D. 6 hours
51	1-11½	—	—	—	—	—	Breast			
52	4- 8	—	—	—	—	—	.....			D. 1 day
53	4-13½	2½	4-11	—	—	—	Breast		Atelectasis Pneumonia and ventricular hemorrhage	D. 6 hours D. 2 days
54	4- 4	—	—	—	—	—	.....	Placenta previa	Atelectasis	D. 2 hours
55	4- 1½	—	—	—	—	—	Breast	Intestinal obstruction		D. 1½ days
56	4- 2	—	—	—	—	—	Artificial		Pneumonia	D. 6 months
57	4-12	—	—	—	—	—	Artificial	Syphilis	Atelectasis and syphilis	D. 2 weeks
58	4-15¼	—	—	—	—	—	Artificial	Syphilis	Syphilis	D. 1 week
59	3-12½	7½	3- 5	—	nil	3	Breast			Unknown
60	4- 3½	3	4- 0½	4- 6¼	0- 2¼	2	Breast	Toxemia		
61	4-14¼	10½	4- 3	—	—	2	Breast			
62	4- 7	?	?	4-14¼	0- 7¼	2	Breast			
63	4- 7	10½	3-12½	5-11	1- 4	8	Artificial	Insanity		
64	4-11¾	4¾	4- 7	4-15¼	0- 3½	2	Breast			
65	4- 3	5½	3-13½	—	nil	2	Breast			
66	4-13	8¼	4- 4¾	—	nil	2	Breast			
67	4-14¼	4	4-10½	5- 6¼	0- 7¾	2	Breast	Eclampsia		
68	2- 8¾	3¾	2- 5	2-13¾	0- 4½	—	Breast	Eclampsia		
69	4-14	—	—	4-15	0- 1	4	Artificial	Vag. Caesarian	Pyemia	Died A. and W.

We feel that conclusions concerning the management of these children should be made only after observations have been carried on over a considerable period of time under intelligent directions, so for these reasons the infants discharged are carefully followed in their homes by the Board of Health Nurses and Physicians and in this way our initial work has been proven to be not in vain, and we have shown that permanent results can be obtained in what might at first appear to be almost hopeless cases.

From the foregoing it will be seen that of 45 cases followed for one year that 42% survived and were living at the end of the first year; 80% survived the first four days and 62% the first three months. The lowest weight of those that survived was 2 pounds 7 ounces, with an initial loss of  $4\frac{1}{2}$  ounces. This infant on account of secondary anemia was transfused at the 7th month. Three other infants whose birth weights were 3 pounds or under survived one year. Of the complications producing death 18% were respiratory and 15% digestive, which of course is a remarkably low figure for either of these disturbances. This we felt to be due to the segregation system and the universal employment of mother's milk. Over 50% of the cases were discharged on breast milk alone.

#### REMARKS

The weight of a premature infant is the best criterion as to the prognosis. From our observations, it may fairly well be assumed that a child weighing more than  $3\frac{3}{4}$  pounds will probably live, and under that probably die. If an infant weighs under 3 pounds the chances are very poor; every ounce over 3 pounds improves the prognosis. In spite of this, however, one must not despair of the very smallest infants. The early exhibition of breast milk and the continuance of this through the early months offers the best means at our disposal for ensuring survival and combating the various complications to which the premature infant is prone. The premature infant should be carefully observed, especially during the first year, and rickets and anemia to which they are subject should be met with by the proper therapeutic measures.

## SOCIETY REPORT

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### NEW YORK ACADEMY OF MEDICINE, SECTION ON PEDIATRICS

*Stated Meeting, Held May 10, 1917*

THE PRESIDENT, ROGER H. DENNETT, M.D., IN THE CHAIR

#### THE AURAL COMPLICATIONS OF THE EXANTHEMATA

DR. HENRY LOUNDES LYNNAH said the percentage of acute suppurative otitis media in the exanthemata was governed by the degree of severity and the duration of the nasopharyngeal lesion at the outset of the disease.

In diphtheria, even when the throat lesion was severe or of the nasopharyngeal or glander type, it was rather rare to meet with aural complications. The percentage of aural infections in this disease clinically varied from two to four per cent, the greatest proportion of infection occurring in the intubated cases. A few years ago it was the custom at Willard Parker Hospital to feed all intubated cases by the gavage method; the percentage of otitic complications at that time was extremely high, between 6 and 10 per cent, about four times as great as at the present time. The same routine was practiced at the Kingston Avenue Hospital, but since these methods had been discontinued, aural complications were almost unheard of. Dr. Lynnah said he had yet to see an adult with diphtheria develop a mastoiditis. He had, however, had the good fortune to observe one case in which there was an extension of the diphtheria membrane through the eustachian tube into the middle ear, an occurrence which was exceedingly rare. The extension was bilateral. Both drum membranes were incised under gas, a long incision being made which was followed by free bleeding. The ears were irrigated with a warm boric acid solution and antitoxin administered. In the course of 24 hours both incisions were closed with the exception of a small pin-point opening and were covered with diphtheritic membrane. A small portion of the membrane extended outward and involved the floor of the right canal. With a pair of bayonette forceps the diphtheritic membrane was removed from both drum



membranes. Applications of antitoxin were made to the drum membranes alternated with hot irrigations. At the end of 5 days the condition had abated and the middle ear gradually returned to normal. The patient's hearing at the present time was practically normal.

In scarlet fever the percentage of aural infection was seldom below 10 per cent, and might even be as high as 30 per cent, there being a marked variation according to the severity of the epidemic according to figures collected by different authors. The great majority of aural complications in scarlet fever occurred early, during the first to third week of the disease, but might develop post-scarlatinal as late as the tenth week. The writer felt that the local naso-pharyngeal lesion was wholly responsible for all of the otitic complications and disregarded the fanciful idea of the otitic lesion being a manifestation of general infection independent of the pharyngeal lesion. The tonsils and adenoids were a constant source of infection and reinfection during convalescence which he thought accounted for aural complications late in the disease.

The early aural infections usually occurred in the post-nasal and grandular type of scarlet fever in contrast to the small number of infections which occurred in the similar type of diphtheria. These early complications were often masked by the dull mental condition of the patient, and if the drum membranes were not examined from day to day, mastoid complications might be well advanced before they were recognized. When the membrane was at all reddened it was well to make a free incision before spontaneous rupture takes place. The temperature in this type of case was high from the outset of the disease, and the aural complications seemed to have no more influence on the temperature curve than the cervical glands or accessory sinuses of the nose which were involved in each instance.

In measles the percentage of aural infections also varied with the severity of the infection and was usually from 10 to 12 per cent, but might be as high as 20 per cent, clinically. The greatest proportion of infections occurred in the catarrhal and post-catarrhal stages and seldom later than the end of the second week. At times aural complications in measles might be extremely violent as in one case coming under the author's observation, in which a middle ear and mastoid developed on the



fifth day, and acute purulent labyrinthitis on the eighth day, and the patient succumbed two days later from a diffuse purulent leptomeningitis. This was the most fulminating type of aural complication that the writer has ever seen.

In a study of the cardinal symptoms of aural complication in the exanthemata taken collectively, it was not so much to the symptoms that were present, as to the absence of symptoms that he would direct attention. The age of the patient had an important bearing on the aural complications. In diphtheria, intubated cases in young children were the most susceptible to aural complications on account of constantly coughing secretion into the naso-pharynx; adults were seldom ever attacked. In young children the susceptibility to aural complications in scarlet fever was usually greater than in adults. In measles, the child and the adult were equally susceptible, and the adult far more frequently complicated with mastoiditis.

Pain was frequently masked at the outset and as a constant sign was rather unreliable; hardness of hearing might make its appearance early and always called for prompt aural examination. The temperature was invariably high at the outset in all severe types of scarlet fever and measles, and the otitic complications seemed to have no more influence on the temperature curve than the necrotic throat lesion or cervical glands. In many instances subperiosteal abscesses might develop with no rise in temperature, and it was not infrequent in scarlet fever and measles to find extensive destruction of the mastoid process and the temperature not to be elevated above 99 degrees. The temperature curve while usually an important symptom was frequently subject to wide variations.

The appearance of the drum membrane in the ordinary catarrhal type was little different from that of the ordinary infections. Marked retraction was far more frequent than bulging in the severe cases early in the disease, but when middle ear infection took place the membrana tympani presented a peculiar purplish gray color and were not of fiery redness. Sagging of the posterior-superior wall of the canal was a fairly constant sign and it was infrequent to see the whole of the posterior wall so markedly infiltrated that the membrane simulates furunculosis and the drum membrane is seen with considerable difficulty. On the other hand there were instances in which there was but

slight injection of Shrapnell's membrane extending down along the hammer handle; these presented a typical picture of tubotympanic congestion, with no marked pain referable to the middle ear or mastoid, no temperature or marked impairment of the hearing, but constant irritability, a peculiar feeling in the head, and inability to sleep. The writer had incised membranes on this one symptom and in almost every instance there was a profuse discharge from the middle ear a few hours later. Tenderness over the mastoid process or antrum was in many instances an unreliable symptom. When this symptom was present it might frequently be masked by the application of an icebag or Liter coil and hence in the writer's opinion their use was contraindicated as they might lead to a great source of error. The character and duration of the discharge and the appearance of the drum membrane as to sloughing, and persistent sagging of the canal wall were the most reliable signs indicative of a mastoid involvement.

It was rather surprising in these diseases to note the absence of such complications as brain abscess, sinus thrombosis, etc., in comparison with the ordinary types of aural complications. The speaker said he could recall but one case of sinus thrombosis of otitic origin operated upon at the Kingston Avenue Hospital during the past five years. This case was complicated with metastatic joints, focal necroses of the liver and septic infar of the spleen, and terminated fatally. Internal jugular vein and sigmoid sinus thrombosis were noted in four cases without any involvement of the middle ear or mastoid antrum during life, or at autopsy. He had never seen a brain abscess as the result of an aural complication and labyrinthin involvement was also rare. Of meningitis two cases had been recorded.

Preventive measures were, of course, the removal of tonsils and adenoids. The antistreptococic serum had apparently done good when used locally and was worthy of further trial. Nose and throat irrigations had been blamed for the high percentage of aural complications; they might be a cause but when carefully performed seemed to have little influence of the otitic complications.

The treatment of these conditions was purely by surgical methods. Early and free incision of the drum membrane was indicated when there was the slightest sign of congestion and was

always preferable to spontaneous rupture. Dr. Lynch was not a believer in the ultraconservative method, and certainly when the aural complication in the cardinal one, it demanded prompt attention. In many complicated cases operative results were not gratifying and the hearing apparatus was saved no better than the life of the patient. On the other hand when the middle ear and mastoid symptoms occurred late, the hearing was always saved in spite of other complications. The writer's observation had convinced him that early operation in mastoid disease was absolutely contra-indicated in the case of many complications. He had been practicing conservative measures in all of his many complicated cases and had had a very low mortality.

In all cases of exanthemata the aural condition should be carefully followed from day to day or else aural complications might be far advanced before the condition was recognized.

ABSTRACT OF DISCUSSION ON DR. LYNCH'S PAPER

DR. HENRY KOPLIK said he was very much interested in the part of the paper that he heard. He would like to ask the reader of the paper if he had made use of an examination of the ocular fundi in cases in which both ears were involved and it was difficult to determine on which side there was sinus involvement. This examination was sometimes very useful as one might find hyperemia and choked disc on the side that was involved.

Also, he supposed there would always be a strife between the otologist and the pediatrician with reference to operating on severe cases of otitis in babies, six months of age, or one year or up to two and one-half years. In these severe cases of otitis whether they were primary or secondary to some one of the exanthemata there must be some involvement of the mastoid; the mastoid was as a rule infected. The only question was whether they should be drained from in front or behind; whether they should be cut and drained early or should be drained from the canal. When there was swelling and sagging of the posterior wall of the canal he did not deny that there was usually mastoid involvement, but these children got well by repeated free incision of the posterior wall and incision down to the bottom of the canal. The average otologist was satisfied with a small incision. In his hospital service free incisions were made and they had very satisfactory results in many cases, and it was very seldom that they had to do

a mastoid operation. If the otologist was willing to repeatedly open up very freely he would find that these patients would get well right along without doing a mastoid operation.

DR. HENRY HEIMAN said they had all enjoyed this paper very much because of the many facts brought out, but he also wished to register his protest against the too frequent and promiscuous incision of red ears. He said he used to permit the incision of these ears by the consultant whenever he advised this procedure and had 3 or 4 mastoids a year. Now when he did not allow the consultant to dictate in so many of his cases he did not have more than one mastoid in 10 or 12 years. There must have been something radically wrong in doing a free and early incision; they had found that if they waited and managed a case on common sense lines the children got well in most instances, excepting where there was intense pain and bulging. Dr. Heiman stated that he had been ultra conservative and had had no reason to regret it. One might often have simply a catarrhal otitis and these patients would get well without operative interference if one had a little patience.

DR. LYNNAH, in closing the discussion, said that in answer to Dr. Koplik's question as to whether the ocular fundi were examined, he might say that the fundi were examined in the case with the positive blood culture but no papillitis was noted by Dr. Wootton, the ophthalmologist, in either disc. It had been their experience that papillitis was a sign of sinus thrombosis but no choked disc was present in the case recorded, even though we had a positive blood culture and knew that there was some venous sinus involvement. He had mentioned that they were unable to tell which sinus was involved as the patient was admitted with all of the accessory sinuses of the nose involved as well as the mastoids so they played a waiting game and the patient recovered.

Of course some of the patients recovered after free incision of the drum membrane and mastoid operation was not necessary, but in others frequent incisions were necessary and even then proper drainage was not established. It seemed to make little difference as to the size of the incision or whether we made a posterior triangular cut; all of them had a tendency to close and leave only a small pin point opening causing damming back of the drainage and finally we had to do a mastoid operation. He did



not believe in doing a mastoid operation on every case that showed one or two symptoms, for many did get well as the result of primary myringotomy, but he was speaking of the cases that required many incisions to establish drainage. In these cases drainage was never established until mastoidectomy was performed and certainly frequent incisions always called for mastoidectomy.

About the early incisions in the slightly reddened drum membrane to which Dr. Heiman referred, it had been the speaker's experience that the slightest redness of the drum membrane in the exanthemata called for immediate and free incision rather than allow spontaneous rupture. For it was not at all common to see after spontaneous rupture complete destruction of the drum membrane leaving the inner tympanic wall plainly visible. Dr. Lynah then referred to a case seen in private practice the cause of the infection being the Friedlander Bacillus. This patient was a prominent physician of this city who was suffering from what was supposed to be tubo-tympanic congestion from the clinical picture. There was no congestion of bulging of the drum membrane and the membrane was apparently perfectly normal with the exception of a very slight reddening about the hammer handle and umbo. There was no temperature, but there was a distressing feeling about his head and constant inability to sleep. He was seen by several of the aurists of this city who agreed that there was no indication for myringectomy and one of them informed him that he had "mastoid on the brain". Finally after a week of suffering with the annoying symptoms of irritability and inability to sleep the drum membrane was incised. There was free bleeding at the time of the incision and the drum membrane cut with a leathery feel and not with the parchment-like feel of the normal drum. No pus followed the incision, but three hours later there was a profuse discharge which showed a pure culture of the Friedlander bacillus. The mastoid cavity was opened on the following day and the dura was found to be almost completely uncovered over the cerebrum, there being a large epidural abscess. Had not the incision been made in the drum membrane on the two symptoms of irritability and inability to sleep the patient should undoubtedly have developed meningitis. The incision was fortunately made in time and the operation saved his life.

SYSTEMATIC BOARDING OUT VS. INSTITUTION CARE FOR INFANTS  
AND YOUNG CHILDREN

DR. HENRY DWIGHT CHAPIN said the charts presented were prepared by the State Board of Charities and showed the relative average rate of increase in the population of the State as compared with the fluctuations in the population of the institutions for children. These tables showed a much smaller number of children at the end of each year than were admitted during the year. While some of these infants were discharged or transferred elsewhere a very large number died. As the number of infants in the institutions at one time was not given the mortality rate could not be given, but a study of this question by the committee of the American Association for Study and Prevention of Infant Mortality, based on the statistics of 11 institutions operating in New York State, showed that for the 5 years from 1909 to 1913, inclusive, 28,210 children under 2 years of age were cared for by these institutions and that the death rate for babies under 2 years during this period, based on the total number of children cared for, varied from 183 to 576 per thousand with an average mortality rate for 11 institutions of 42.25% for the 5 years. During this period the death rate for children under 2 years of age, based on the estimated population of the State at that age, was 8.74%, practically one-fifth of that of institutions.

The institution was not a favorable place for the permanent housing of infants, because the infant needs individual watching and care. It needed a home and a mother. The farther we got away from these normal conditions the more the baby suffered. A baby could lose from a restless untended night the good that might have taken days of care to secure. Babies in institutions rarely got sufficient fresh air and oxygen as was necessary to their well-being as protein or fat. There were other dangers in collecting and treating infants en masse, such as pertussis, diphtheria, and the exanthemata. Institutional infants seemed to lose their immunizing power against bacteria after a time. In view of the failure of the institution to solve the problem of the care of the dependent infant, the Speedwell Society organized some 15 years ago to oversee and carry out the work of boarding out infants in homes. The plan followed required that the work be done in certain definite localities, that served as units. Each unit must be under the charge of a physician

and a nurse and such assistants as they might need. The same care, system and routine applied in institutions must also be applied here. The advantage of the plan lay mainly in the fact that the work was done largely through human agencies instead of depending over much on a plant or machine. The Speedwell Society emphasized the following points: First, a district was chosen which was noted for its healthful conditions; Second, there had been constant attention to diet and hygiene on the part of the physician and nurse in charge who were thoroughly competent to deal with this class of cases; Third, the infants were kept as long as necessary. Work was kept up during the whole year. Fourth, the training in a given neighborhood of a number of foster mothers who, by constantly taking these infants into their homes, became fairly expert in handling them under conditions totally unlike those offered by the best institutions, and far superior to them. Each village around a city could have its unit with doctor and nurse working under the direction of a local committee.

From the financial standpoint this plan was thoroughly sound. Instead of investing large sums of money in institutions and heavy overhead expenses, the funds were given directly to individuals for their services. The money thus expended served two purposes; it provided the infant with the home which it needed, and it assisted a poor family to raise its standard of living. Buildings used as institutions for the care of dependent infants and children were not taxed, which meant that the community at large must make up this deficit by additional taxation and this indirectly contributed an additional cost. The Speedwell method of carefully regulated boarding out, including the salaries of doctor, nurse and all expenses amounted to \$1.15 per day per infant as against a cost of from \$1.54 to \$1.98 in 4 hospitals of New York City.

The Speedwell unit at Morristown, N. J., had during the past year a mortality of 16% among a class of marasmatic babies under 6 months of age every one of which would ordinarily have died under institutional care.

#### THE CARE OF THE CITY'S DEPENDENT CHILDREN

HONORABLE JOHN A. KINGSBURY said that as Dr. Chapin was speaking he had realized more than ever the advantages of

the system which he had put into effect for caring for dependent children. He also had realized how little he himself had accomplished during the past three years in his endeavor to shift from the mass plan to the individual plan. On March 1st of this year the Department of Charities had inaugurated a policy which would result in a more marked diminution of the infant death rate than had been seen in many years if, indeed, ever before. In 1916, 16,000 infants died in New York City, and of these 1,000 deaths occurred in the population of one institution alone. Mr. Kingsbury said he was not arraigning any institution in particular, but merely showing the high death rate of infants in institutions; neither was he here to shift the burden to other shoulders; it was his burden, and some of it was on the shoulders of his hearers. No citizen of New York had done his duty until he had come forward and put it up to the Department of Charities to do their duty. No one held office except by the consent of the citizens. He held the State Board of Charities as most culpable in that they had not seen that the overseers of the poor did their duty.

As the work which had been initiated on March 1st.—Ordinarily about 87 babies were committed each month. The mothers simply gave up the babies by surrender. The State Board of Charities required that the Commissioner of Charities should see to it that the dependent child got a chance to develop into a strong, normal man or woman, but the law also required that we investigate the circumstances of every proposed commitment and find out whether the child was a public charge, whether its parents had settled in this city and whether they were able to support it. Some controversy grew out of the question whether these children were properly committed, and an investigation was made into commitments. No one seemed to know much about how these commitments were being made and it was decided to throw light into the realms of darkness. Most of the institutions were willing to be investigated but a few thought we had no right to interfere, that it was none of our business whether Johnny Jones had warm clothes and went to school, and the reason they had trouble was because they started out to make it the business of the Department of Charities to know whether Johnny Jones was properly cared for. The investigations made showed that in some of the institutions the children had vermin and were



over-worked and under-fed. Mr. Kingsbury said he was delighted to be able to report now that the results of a recent inspection showed that the children were no longer over-worked and under-fed, that they were no longer sitting on backless benches and eating from coverless tables and walking lock-step. They had made some headway.

Since last October the children under 8 years of age that have applied for commitment had been given to foster homes and not to institutions. About 4,000 children had been placed in temporary homes in this way. The number of children in institutions had been about 24,000; it was now 20,000. If the present program could be continued, within 4 or 5 years we will have reduced the institutional population to 10,000. It was what physicians were going to do towards this work that was going to count. Practically all normal children were going to be put into normal homes.

They were also planning an investigation of the children at present in institutions for the purpose of classifying them. All those children whose parents had died of tuberculosis would be given the von Pirquet test and these children would be put in open air schools; this would mean about 50% of those in institutions. Many of these would be better cared for in institutions than in homes. Then they would take the crippled and put them together and the blind and the deaf each by themselves. They were going to do this even if it cost considerably more than was now being expended.

Another curious anomaly existed. There were 15,000 normal children in institutions that needed normal homes and there are about 15,000 mentally defective children, that were a burden and a constant source of trouble to their parents, who should be in institutions and should be segregated. In order to provide for some of this latter class he had been rebuilding Randall's Island. He felt that he had concentrated his attention too much on the work at Randall's and Blackwell's Islands and had neglected this work of Dr. Chapin's and that he was responsible for a high infant death rate, but he had been much harrassed in the administrative work.

In their investigations they had found that many children of non-residents had been committed and also that though the law provided that children shall be placed in institutions of the

same religious faith as that of their parents, that this had not been carried out as faithfully as it should have been. They were now seeing that this part of the law was carried out.

Of the women who came to surrender their children many were married and another child was a burden too heavy for the family. Then again there were the unmarried mothers who wished to surrender their children. In many of the latter cases they had succeeded in finding the father and making him assume a part of the burden of supporting the child. They had found that if they could convince these unmarried women of their responsibility toward these children they decided to care for them and a great feature of our work was paying mothers to care for their own children. The married mothers were always glad of this opportunity and when these unmarried girls could be persuaded to keep their babies it not only saved the baby but the mother as well.

MR. KINGSBURY said he wished it were not so difficult to take a new step, but it was the most difficult thing in the world to make a change as we are so hedged about with "red tape" and formalities. If it were not so difficult to take this step he thought we could have several more units like those described by Dr. Chapin but he meant to "continue to fight it out on this line if it took all summer." The nearer the baby could be kept to the mother's breast, the better chance it had for life, health, and strength; if we did not leave the baby with its mother its chance was gone. The death rate of New York was going down this summer for which the milk stations, the Health Department and other agencies would take the credit, but it would be because we were putting children in homes where they could receive a mother's care.

#### THE CARE OF SICK CHILDREN IN THE HOME

MISS LILLIAN D. WALD said she was glad to have this opportunity to urge the doctors to utilize to a greater extent the service she was going to explain, the Visiting Nurses Service of the Henry Street Settlement. In 1916, this service cared for 29,015 cases, 33% of which were referred to them by physicians. A very small percentage of their cases came to them from various agencies. Next to the largest percentage of their cases came from the Metropolitan Life Insurance Company. Some had come

from the social service departments of hospitals, which notified them when a patient had been discharged from a hospital and needed further daily care.

Dr. Chapin and Commissioner Kingsbury had referred to the possibility of education in the homes. It was their experience that they almost never found these mothers unteachable, if one knew how to approach them, to use terms which they could understand in making explanations, and used the utensils with which these women were familiar. They had had three years experience in a milk station provided from Mr. Macy's private dairy and among the babies cared for there the death rate had been one-half of one per cent. They had been able to get into factories at noon to address workers and thus had been able to give health instruction to large numbers of girls and women. They had also been of assistance to the Committee for the After Care of Infantile Paralysis.

In the beginning of their work they had had some difficulty in making doctors understand the advantage of sending for a nurse unless she stayed all day. They were in reality conducting an economical visiting hospital. Nearly 30,000 people had found it to their advantage to have a nurse accessible and these not only the very poor but people on small salaries. This nursing hospital extended its services from the Battery to the Bronx and was hoping to include Richmond and Queens in the near future.

It was not possible to make accurate comparisons between their results and those obtained in hospitals, but they had been able to get some valuable information with reference to results in pneumonia. From their very favorable results in the care of pneumonia cases, some had deduced that the children treated were not so very ill, but this was not the reason of their favorable results for some of these children were extremely ill. Their records showed that they had cared for 3,988 cases of pneumonia last year with a mortality of 8.6%. Of these 3,988 cases, 70% were children under 5 years of age. They had cared for more pneumonias than any other single disease.

The plan under which they worked was that each nurse was assigned a small district, and each morning started out to make the calls in that district that had come in during the previous evening or early that morning. The doctors who had learned

to avail themselves of this service left instructions as to the nursing treatment that was to be carried out. Their care of tuberculosis patients was limited to bed patients, but among these they had been able to do a useful work by inducing many who did not feel disposed to go to institutions to decide to take this step. Where special night care was needed they put on a special night nurse. The poor were cared for free of charge, and many who were able to pay only a small fee, 5 or 10 cents, paid that; these small 5 and 10 cent fees had amounted to \$10,000 during the past year. The nurse made 1, 2 or 3 visits a day as the case might require. Of the nearly 30,000 patients treated during the past year, over 26,000 were cured. Both physicians and the public were invited to inspect this service and to take advantage of it.

A PROPER BASIS FOR A LAW TO PREVENT OVERCROWDING IN  
INSTITUTIONS AND HOSPITALS FOR CHILDREN

Report of Committee appointed by the Section of Pediatrics in response to a request by the Executive Secretary of the Public Health Committee of the New York Academy of Medicine to render an opinion as to what constitutes a proper basis for a law to prevent overcrowding, which is prejudicial to the health of children and as to advisability of changing the present law, Dr. Thomas S. Southworth reported for this committee, the other members of which were Dr. William L. Stowell and Dr. Phillip Van Ingen.

An examination of the present law seems to show that it was designed to apply to dormitories or sleeping quarters of older children, and that there is no evidence that the framers of the law had in mind its application to infants, whose nutrition and susceptibility to disease call for the best possible care and hygienic surroundings, differing in no essential respect from those obtaining in hospital wards. That hospitals are specifically exempted by the law strongly supports this view. It had, however, for many years applied to such infant wards in institutions.

While specifying 600 cubic feet as a minimum, the law gives any local board of health the power in any ward where the opportunities for ventilation are judged sufficient, to reduce the allowance for each occupant of the ward to any degree which they approve. Under this clause the space required per inmate has been reduced in many institutions caring for infants to about 500



cubic feet and printed and written permits are issued therefor which must be displayed in the wards.

The Monthly Bulletin of the New York Board of Health, August 1916, states that anything below 500 cubic feet per person is insufficient for an office worker who is obliged to remain indoors practically throughout the year. These adult workers have opportunities to get much more fresh air during their non-working hours. Institution infants throughout a considerable part of the year remain commonly in the same crib and ward practically continuously during the entire 24 hours, and their attendants who are not considered or included in the permit, help to vitiate the air of the ward.

Three main factors enter into the question of cubic space per infant in a ward. (a) Space to afford reasonably pure air for respiration. (b) Space to allow sufficient separation of the cribs in order to minimize air-borne infections. (c) Space to avoid the overcrowding which operates to reduce the individual care which can be given to each infant by a limited number of nurses and attendants.

Metabolic requirements of the infant are therefore relatively much greater than those of the adult and there is therefore need of a proportionately greater amount of oxygen. The metabolic experiments of Vierordt and others make it clear that the respiratory needs are but a single factor. Equally important are the temperature, humidity, barometric pressure and motion of the air in determining the heat expenditure of the body. Experience has shown that while breast fed babies may do fairly well under conditions of overcrowding which are fatal to bottle babies, the artificially fed infant requires a maximum of space in order to thrive.

For respiratory purposes an adult needs 30 cubic feet per minute of fresh air. Modern hospitals for adults require 1800 to 2000 cubic feet, with more for infectious cases. Inquiry shows that pediatricists generally feel that children should have 1,000 to 1,500 cubic feet available, and these amounts are provided in the most modern hospitals for infants. The present law refers to ventilation free and adequate, as if it were the simplest matter in the world. Mechanical methods of ventilation are admittedly unreliable. The mere presence of windows as noted at an annual inspection does not guarantee their use nor their effectiveness in ventilation. It is absurd to base cubic space for

infants, permitted by law, upon standards so low that to prevent their being injurious to the infants they must be supplemented by measures which are often notoriously absent or neglected in common practice, and which up to the present time there has been no adequate method or power for enforcing.

When one considers the stress now laid by pediatricians upon the part played by ward infections in the morbidity and mortality of infants when gathered together in numbers, the present proximity of cribs permitted by the law is to be condemned. It has been shown that overcrowding results in under-care and pediatricians are unanimous that care is imperative if artificially fed infants are to be made to thrive. The pediatricists in the infant's wards in the Hospital of the University of Minnesota have specified six feet as the desirable minimum for the separation of cribs. If every infant were allowed a minimum of 100 square feet of floor space, equivalent to 1000 feet of cubic space, or more, according to the height of the ceiling, this distance of six feet could be approximated.

In view of the foregoing the committee further reports that the present sections of the State law should be repealed or superseded and new sections enacted, making separate provisions for institutions in whose dormitories older children above the run-about age spend their sleeping hours. Also separate provision should be made for all wards containing artificially fed infants under fifteen months of age, all such wards being considered as hospital wards, whether the infants therein be nominally admitted or rated as well or sick infants.

The law should provide for the installation in all wards of devices for window ventilation which shall be practicable at all seasons when the windows are closed, and should provide for frequent inspections to observe and enforce their use. Six hundred cubic feet as a general basis for babies, sick or well, nursed or bottle-fed, is too small. Two feet of separation for the beds is too small, to reasonably minimize cross infections. Pediatricists are of the opinion that 1000 to 1500 cubic feet are needed. Where the standard is based on cubic space alone the above should be required. A standard of not less than 100 square feet of floor space should also be adopted. Artificially fed babies should be rated as sick babies. New born infants might be excepted for a period of two weeks after birth if nursed at the breast.

Cubic space is not a complete standard. Ventilation is important and complementary. Exceptional standards might be allowed in well kept, efficiently managed, and properly ventilated institutions, but such standards should be definitely outlined by the Department of Health and should take into consideration, height of rooms, floor space allowed, sun-light (exposure), facilities for ventilation, methods employed to secure proper ventilation, character of babies received, number of babies in a given ward, length of time spent in wards, proportion of nurses to babies cared for, number of adults in wards at various times, the infant mortality in the institution in question.

The standards of pure air are apparently as follows: temperature 62° to 68° F., humidity 50 per cent. (Wet bulb thermometer should register below 70° F.); movements gentle currents, three feet per second, two miles per hour. Carbon dioxide content ought not to exceed six parts per 10,000. The air should be free from dust, microorganisms, gases and odors; it should not contain above 5L microorganisms per c.c. Twenty cubic feet per minute should be allowed per child.

DR. MAURICE FISHBERG said that the audience might be surprised that in as much as he was not a pediatrician he had been asked to participate in the discussion; it was because for many years he had been interested in social medical work. Medical sociology had always held an interest for him and through this he had come into contact with Miss Wald. Dr. Chapin's work in boarding out infants had likewise interested him for years.

Miss Wald had obtained most remarkable results in caring for sick children in the poorer sections of the city, where the people were living in badly ventilated tenements, many of them vermin-ridden. It was noteworthy that given 100 cases of pneumonia in infants and children cared for in the best modern hospitals and at least 33 per cent. would die. When this mortality rate was compared with that obtained by the special care given by these nurses in the homes of the children, one could not but feel convinced that such work would save not only New York, but it would save the world. One also came through the study of such results as this to realize that proper ventilation was by no means the only factor in the proper care of young children.

DR. CHAPIN had rendered a service to his country; he had been a true pioneer in this work, which had not been appreciated to the extent which it deserved. The outcome of the present war

would be a great reduction of immigration; the people of Europe would be needed at home. The birth rate in the United States had declined almost to the extermination of the native stock. The immigrants had supplied the birth rate until now. Now we were sending infants to institutions and killing them off from 40 to 70 per cent.; 50 to 90 per cent. of those under six months of age. This condition of affairs might be corrected if it were treated from the scientific standpoint. The institutions had failed so far in the care of young babies and children. In one of the best institutions in this city 16 children were taken at random and it was found that eight had suffered from rickets, although we should be thankful they survived. Now 50 per cent. of children with rickets was something one would not find in the tenements.

In orphan asylums the children, compared with children in the tenements were much inferior both physically and mentally. The Municipal Research Bureau of this city a few years ago sent an anthropologist from Columbia University to investigate 1,000 children. These children were found to be four years retarded in physical development, in height and in weight, as compared with poor children taken at random on the lower East Side. Those children examined were in one of our best institutions under the best conditions. Dr. Fishberg said he had made careful observations on children discharged from institutions and found that they were shy, feared people and probably had a mental development of three to six years behind that of children who had developed normally. So it might be seen that Dr. Chapin was doing a remarkable work when he was keeping children out of institutions.

In closing, Dr. Fishberg stated that Miss Wald had been more conservative than the facts warranted; she exerted an influence on these children morally, physically and from the pathological standpoint and should be encouraged by the medical profession.

#### DISCUSSION ON DR. CHAPIN'S PAPER

DR. ALFRED F. HESS said that what he wished to bring out was that if we wished to compare these two systems, the institutional care of children and the boarding-out-plan, we must compare them at the same level. It was not fair to make a composite list of figures from the worst institutions and compare them with the figures, for instance, of the Sage Foundation Babies' Ward or with the results of the Speedwell Society's work. If we



wished to make a comparison of this kind we must take things at their best.

DR. HESS said he had been interested in Dr. Chapin's Speedwell work and had here the reports covering a number of years. In going over the records of twelve to thirteen years ago he found that there was a mortality of  $33 \frac{1}{3}$  per cent in children under six months of age and of 13 per cent between six and twelve months. During the last year the mortality had been 16 per cent for the babies under six months of age. Still the cases are very few in number, not more than 50 in a whole year, which was hardly an experiment that could be considered applicable to New York City. There were only 27 cases treated under one year. That was all very well but it could not be compared with the cases here in institutions. He did not know whether it would be applicable if we took 1,000 cases and boarded them out properly. Or again if one took the Sage Foundation; there were only 10 babies for each physician and yet the mortality was 46 per cent. This was not a fair comparison.

Commissioner Kingsbury spoke of 1,000 infants in one institution dying in one year. Were not some of those children boarded out? Dr. Hess said he thought he knew to which institution he was referring and that they had been boarding out cases in considerable number.

Now as to the institutional cases, there was something to be said for the institutions. Last summer there were more cases of infantile paralysis throughout the city than in the institutions. By means of the Schick test and anti-toxin injections diphtheria had been practically eliminated from our institutions.

As to the question of vermin, they were not characteristic of institutions. In the Tuberculosis Preventorium that had been such a serious problem among children coming from homes that they had employed a nurse who did nothing but care for the heads of children entering the institution.

The Commissioner said something to the effect that institutions were not good enough to care for healthy children but he thought the pretuberculous children could well go to institutions. In other words what was not good enough for the well child was good enough for the undernourished.

Whether people came from other cities to leave their children in our institutions had nothing to do with the questions, nor had the problem of mothers surrendering their infants.

A third method of caring for dependent infants had been mentioned, that was the plan of giving a child to its mother and paying the mother to care for it; this was better than either of the other methods of care.

Dr. Chapin, in closing, said these figures were averages which it was perfectly fair to take and those of the State Board of Charities which were official; it is certainly a fair thing to quote averages.

Dr. Hess failed to mention the cases of gonorrheal vaginitis, scarlet fever and other infections contracted in institutions. He would like to ask him about these.

In the earlier years in institutions there were all kinds of diarrheas and toxic conditions, and there was not a single case of that kind that would not have died in an institution. But we had found that it was not wise to send acute toxic cases. However, the marasmus cases on the bottle they did send out and had obtained a mortality of 16 per cent, under six months which was better than could be shown in any institutional work dealing with these cases.

I do not board out babies as the institutions did, giving them to some poor woman and then seeing them once a year, so that is not a fair comparison. His mortality certainly compared very favorably with the 100 per cent. mortality of this class institutions. He believed that boarding out should be systematized and properly managed; if you took marasmus babies and boarded them out and got a mortality of only 16 per cent under six months you were doing well; also the morbidity was a thing of very great importance.

Then in institutions there were the epidemics to be considered. Dr. Hess was now having an epidemic of measles in the institution with which he was connected. He thought they had an epidemic last year and this year. In over 1,000 cases, Dr. Chapin said he had only three cases of measles in five years and then the disease had not spread to others. It was well known that measles was often followed by tuberculosis in feeble children.

Dr. Hess said the question of vaginitis came up so frequently. Vaginitis was not a disease of institutions, but one that was found throughout the tenements. They had refused admission on this score to one-third the female infants who had applied; almost all who had been rejected had been refused

because of vaginitis. These did not come from institutions but they did come from homes. As a result of these rejections the population of their institution was two-thirds boys and one-third girls.

As regarded measles in the institutions, the audience had all had measles and they were not institutional children. Children got measles at home.

Dr. Chapin replied:—You confess that you have vaginitis in your institution and yet you do not take in children having this infection. Now the child that has vaginitis at homes does not spread the disease, but when you have this in institutions it is spread. That is just the crux of the whole business.

Commissioner Kingsbury said that in speaking of the mortality in the institutions, he had more in mind the saving of lives by leaving the children with their mothers. He was not referring to the boarding-out system versus institutional care. He simply wished to emphasize the matter of providing means whereby children could be left with their mothers. It was true the institution to which Dr. Hess had referred boarded out children and saw them once a year. That form of boarding was only jumping from the frying pan into the fire. He did not want to have children boarded out unless they were given as intensive care and supervision as Dr. Chapin had described, and he did not propose to board children out unless they are given this intensive care.

So far as the vermin were concerned, they were in the homes as well as in the institutions, but he would invite the inspection of five or six hundred homes where they had boarded babies. They had made an inspection of these homes and not one was reported as harboring vermin.

Miss Wald said she would merely emphasize that their experience had been that the chances of recovery were infinitely greater if the patient was well cared for in his home than if in a hospital. They had been unfortunate in sending girls to an institution and having them contract vaginitis. The children they had cared for had, in most instances made recoveries without complications. Their visits to the homes were of great educational value to those homes, especially from the standpoint of infant mortality. What had been told of pneumonia was true of other diseases.

## DEPARTMENT OF ABSTRACTS

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### ORIGINAL CONDENSATIONS OF CURRENT PEDIATRIC LITERATURE BY THE EDITORS AND THE FOLLOWING ASSOCIATES

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CAUTLEY, EDMUND: MALFORMATION OF THE ESOPHAGUS.  
(British Journal of Children's Diseases, January-March, 1917,  
p. 1.)

The paper is a study of the different types of malformation of the esophagus found in the literature up to 1913. He divides malformations of this region into the following types: 1—Complete absence, generally associated with gross malformations as in monsters. Eight cases. 2—Double esophagus with reunion at lower end. Two cases. 3—Diverticula or pouches, pharyngeal rather than esophageal being posteriorly at the junction of the pharynx and esophagus. They are found later in life not in childhood. 4—Cysts lined by epithelium like that of trachea with a wall chiefly of muscular tissue and mucous membrane have been described. 5—Tracheo-esophageal fistula without other abnormality. Six cases. 6—Congenital dilatation generally limited to the portion just above the diaphragm; though not involving extreme cardiac end. 7—Atresia without fistulous communication with trachea. (a) Atresia or stricture. (b) Upper part normal, or forming a culdesac, and the lower portion forming a fibrous cord or more or less completely obliterated. 8—Atresia with the lower end of the esophagus opening into trachea, and very rarely into a bronchus. The majority of cases are of this type. The symptoms are characteristic and diagnosis is easy. On account of the obstruction fluids are regurgitated through the nose and mouth. The accumulated mucus and saliva appear as a bubbly secretion at nose and mouth from



being mixed with air from the lungs. Attacks of suffocation and cyanosis occur, the passage of the catheter reveals obstruction, in the common type, at a distance of 10-12 centimeters from the gums.

There is a case reported of the eighth type, the only such malformation of the esophagus seen by the author in 25 years of hospital practice.

JOHN B. MANNING.

FULLER, AGNES V.: EDUCATION OF THE FATHERS AND MOTHERS OF TO-MORROW. (*The Journal of the American Institute of Homeopathy*, April, 1917, p. 1178.)

Fuller recommends discipline from birth. The infant should not be the ruler of the house any more than the child of 3 or more. The child should be dealt with, with frankness, sincerity, and honesty—especially the sensitive child. Questions regarding the origin of life should be answered truthfully, to retain the confidence of the child. This should be done before the age of 7 as after that age the child usually learns these things at school, or on the street, or elsewhere from playmates. The home should reflect culture, refinement, morality and clean living and the results will cling to the child in form of a taste for the better things. Mothers should be trained for their task. The community should see that the school children are well fed and warmly clad.

MILLS STURTEVANT.

SEYDELL, ERNEST M.: THE TONSILS AS AN ATRIUM OF INFECTION IN POLIOMYELITIS. (*Annals of Otology, Rhinology and Laryngology*, March, 1917, p. 98.)

The author states that, contrary to the findings of several men, the organism of this disease is not a filterable ultramicroscopic virus but a polymorphous micrococcus readily seen in short chains and clumps that have been found in tonsils and adenoids. He raises the question of how many cases in which the tonsils have been removed ever become infected with poliomyelitis, and cites a list of 203 cases averaging 4 years of age, of which the tonsils were present in 200; in the 3 remaining cases, it was noticed that the infection was very light and the complete recovery rapid. The disease can be produced by the injection of the contents of diseased tonsils into animals, and this specific

micrococcus has met all the requirements of Koch's law. The organism may remain active and infective in a patient's pharynx as long as 6 months after he has apparently recovered from the disease.

S. W. THURBER.

JEANSELM, M. E.: CYANOSIS OF SYPHILITIC ORIGIN. (*Arch. de Medec. des Enfants*, Vol. III., 1916.)

The mother during the second month of pregnancy contracted syphilis, was treated and every symptom disappeared. Delivery was at term and the child healthy. Two months later slight specific symptoms appeared in the baby. At the age of 8, following congestion of the lungs, the patient became dyspneic and 3 years later was completely cyanotic. Wassermann positive. This is also the case in another child aged 6 who also is gradually showing cyanosis. Two other children are quite normal and give negative Wassermann.

C. D. MARTINETTI.

BOOT, G. W.: THE TONSIL QUESTION IN CHILDREN. (*Annals of Otology, Rhinology and Laryngology*, March, 1917, p. 129.)

The theory of focal infection now uppermost in the minds of clinicians has led to the removal of tonsils in large numbers. There is need of better determining the function of the tonsils and the kind of local infection present before this question can be decided, but there are indications that may be acted upon with certainty. It is a mistake to remove tuberculous glands of the neck and leave the tonsils; a child suffering from nephritis or streptococcus infection or endocarditis following a sore throat, should have the tonsils removed when its condition warranted it. In chorea, if the tonsils are definitely diseased, remove them and the same applies to rheumatism. The author expects the next generation to be freer from otosclerosis on account of the removal of so many tonsils. Quinsy and tonsillar abscess are always indications for the removal of the tonsils. Hypertrophy may or may not need the operation, as much can be done by the use of syrup of the iodide of iron in children. Children who have had their tonsils removed are less susceptible to the contagious diseases than are others.

S. W. THURBER.

# ARCHIVES OF PEDIATRICS

SEPTEMBER, 1917

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PUBLISHED MONTHLY BY E. B. TREAT & CO., 241-243 WEST 23D STREET, NEW YORK

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## ORIGINAL COMMUNICATIONS

### APPENDICITIS IN INFANTS

BY ISAAC A. ABT, M.D.

Chicago, Ill.

The symptoms of appendicitis in infants show such marked variations from those which occur in older children and adults, that the presence of the disease in very young children is worthy of special attention. The frequency of the disease in infancy may be judged from the figures of McCosh (Jour. of the Am. Med. Ass'n., Sept. 28, 1904, p. 857), who reviewed 1,000 cases of appendicitis in children and found only 4 cases under the age of 2: an infant of 12 months, one of 12½ months, one of 16 months, and one of 20 months. Jalaguier (Traite de Chir., 1903, p. 637) found in 182 cases of appendicitis, only 4 children from 1 to 5 years. The almost complete

absence of subjective symptoms in infants renders the diagnosis not only difficult but, at times, impossible. Pain and tenderness, which are almost universally present in older individuals, are difficult to elicit and more difficult to localize in the first months or years of life. On the other hand, vomiting, one of the symptoms of appendicitis, occurs so frequently in the gastro-intestinal, nutritional, and toxic diseases of infants, that under very few conditions can it be considered pathognomonic. In most instances vomiting is not even suggestive of appendicular inflammation.

One of the first cases in the literature, reported by Holmes (Brit. and Am. Jour. of Med. and Phys. Sci., May, 1847) is typical even to this day. The patient, a boy of 20 months, previously healthy, was suddenly attacked with fever and constipation. There was no vomiting or distention, and he was thought not to be in pain. On the seventh day, the abdomen became hard and tender, and the child collapsed and died. The autopsy revealed an inflammation of the intestine near the region of the cecum. The appendix was perforated and bathed in pus. On being opened, it was found to contain concretions. This history can be passed over with slight comment. A 20 months' baby was sick a week with fever and constipation. No diagnosis was made. On the seventh day, manifest peritoneal symptoms developed. The patient died in a short time, the autopsy revealing an appendicitis.

Another early case is reported by Betz (Memorabilien, 1870, 15, 118). This was a boy of 7 months who was attacked suddenly with abdominal pain which could not be localized. The abdomen was not distended and no special tenderness was elicited. The little patient was obstinately constipated, and no results could be obtained from enemas. In the course of the disease, the vomiting became incessant, and the abdomen more exquisitely tender. The features were pinched, and distorted into an expression of agony. Death occurred on the third day. The autopsy showed a recent inflammatory exudate in the iliocecal region. The appendix, which was adherent to the ileum, was perforated at the tip, surrounded by free pus, and covered with inflammatory exudate. It contained 3 concretions.

Pollard in the Lancet, 1896, reports a boy of 6 weeks in whom the appendix herniated into the scrotum. An abscess of the appendix was found, though it was not perforated. Herniotomy was performed, the abscess was drained, and recovery ensued.



Goyens (*Annal. de la Soc. Méd. Chir. de Liège*, April, 1890) reports a case of a boy 6 weeks old who was suffering from diarrhea. A tumor was noticed in the right iliac region. After death, the autopsy showed a gangrenous, perforated appendix, with peritoneal infection and septicemia.

Bloomer and Shaw report a patient 7 weeks old, weighing 6 pounds and 6 ounces, who suffered from general anasarca and was markedly stuporous. He grew gradually weaker and died. The autopsy showed an acute gangrenous appendix.

Dr. J. P. C. Griffith reports a colored infant of 3 months, admitted to the hospital in a state of collapse. He had a rapid, weak pulse, with a temperature of 102° to 105° Fahrenheit. The abdomen was markedly distended. He was constipated towards the close of the illness, though the case gave a history of diarrhea a few days previous. The baby died the day after admission. The autopsy showed some general peritonitis with a gangrenous appendix.

Jackson (*Am. Jour. of Med. Sci.*, Apr., 1904, p. 710) describes what he thinks to be a case of prenatal appendicitis. A female baby died 40 hours after birth as the result of bichloride of mercury poisoning, the drug having been administered 5 hours previously by accident. At necropsy, the appendix was found congested, twisted upon the cecum, and bound upon it by numerous fibrous adhesions. The reduplicated surfaces of the appendix were likewise bound together by adhesions which adhered so firmly that Jackson is led to conclude that an inflammatory condition of the appendix had taken place before birth.

Cestan (*Ann. de Méd. et Chir. Infant.*, Feb., 1904, p. 94) reports 7 cases of retrocecal appendices in children. He considers this form of the disease relatively frequent in childhood. Its recognition is made possible by distention and pain, by the clear, normal percussion note over the anterior portion of the abdomen, and by the constant flexion of the thigh on the pelvis. Septic peritonitis is less frequent in this form than in other varieties, though he finds post-operative septicemia more frequent. He reports 7 cases, though all were more than 2 years of age.

John Howland (*ARCHIVES OF PEDIATRICS*, 1904) reports 2 cases in young children. One was a boy 22 months old who had abdominal pain on the first day and rigidity on the next. The child had suffered from a recent pneumonia; consequently, immediate operation was delayed. On the fifth day the baby grew suddenly worse. A distinct mass could be felt in the right side, low down.

He was operated within the next two hours. The appendix was found perforated at the base, and there was a well walled-off abscess containing  $1\frac{1}{2}$  ounces of pus. After the operation he had diarrhea, and on the ninth day an attack of cardiac failure. He eventually recovered. The other case, a baby 21 months old, suffered from what the author thinks were recurrent attacks of appendicitis. The first attack was unrecognized. At the second attack, an operation was performed and an abscess discovered. Recovery followed.

Howland remarks that although the disease is uncommon, it should be considered in every case of obscure illness in children. He reports that 3 factors combine to make the diagnosis difficult: 1.—The disease usually runs a course different from that in adults. It is more insidious. There are fewer positive symptoms, and a greater tendency to general septic peritonitis with little previous warning. 2.—Acute digestive disturbance with fever is so frequent in infancy and may occur with such severe symptoms that we incline towards it as being the most probable condition. 3.—With very young patients we must rely upon objective symptoms, the subjective being unreliable, variable, and misleading.

Glazebrook (N. Y. and Phil. Med. Jour., Mar., 1905, p. 483) reports a case of a baby 14 months old who was taken suddenly ill with a chill and cyanosis. The child cried from pain which it seemed to locate in the right lower thorax. Death ensued in a few hours. The autopsy showed a ruptured, gangrenous appendix, a cavity containing an ounce of pus, in which was found the head of a black mourning pin.

Bamberg (Inaugural Dissertation, Leipzig, 1905) reports a child of 5 weeks who died in 9 days with indefinite gastrointestinal symptoms, such as fever, vomiting, and diarrhea with mucus. The autopsy showed a twisted and adherent appendix with purulent contents.

Broca (Brit. Jour. Chil. Dis., 1906, p. 231) thinks that appendicitis in young infants is frequently preceded by enterocolitis. Kermisson and Guimbellot (Revue de Chirurgie, 1906, 34, 441), in addition to a case of their own, report 27 from the literature. Their own case was a baby 11 months old, who had an attack of vomiting, pain, and distention. Bloody material was passed per rectum. Examination showed the abdomen tender, enormously distended, with an enlargement at the base of the thorax. A reddened area above the umbilicus was noticed, and

the umbilicus itself was displaced. There was marked tenderness in the right iliac fossa. Percussion gave tympany over the abdomen, though there was dullness at the hepatic border. The child was greatly prostrated and dyspnoic. The pulse, which was weak, was 120; the temperature was  $102\frac{1}{2}^{\circ}$ . After the operation the child died. The appendix was perforated and contained 2 fecal concretions.

I may close this list of cases with one which recently came under my observation: A little boy, 9 months of age, entered the hospital on January 5th, with a temperature of  $105^{\circ}$  F.; pulse, 156; respiration, 50. He had suffered from bronchitis almost since birth. The baby became acutely ill on Tuesday, January 2d, was feverish, restless, and cried; the following day, January 3d, he vomited 3 times and was obstinately constipated. On January 4th the patient became decidedly more feverish and drowsy; respiration was difficult and somewhat noisy. Before entering the hospital the baby had a severe coughing attack and vomited some dark bloody fluid. During his stay in the hospital the fever continued high, the pulse was rapid, respirations were recorded as high as 64, 80, and 100; there was twitching of eyelids and facial muscles. The bowels moved; vomiting continued; the temperature rose to  $106^{\circ}$  F.; respirations continued exceedingly rapid; pulse irregular. The abdomen, which was distended during the first day or two in the hospital, became flat. The child died.

Autopsy was made shortly after death by Dr. Oscar Schultz, pathologist in chief, and Doctor Perlstein. On opening the peritoneal cavity, a yellowish creamy pus escaped. The intestines were covered with stringy fibrin. The region of the appendix contained much pus and a large accumulation of fibrinous exudate. On closer examination, it was found that the appendix had perforated, and a large fecal concretion was discovered in its lumen. A direct smear from the pus showed the presence of colon bacilli.

In this young infant, the diagnosis of abdominal disease was difficult, the possibility of a perforative appendicitis in a 9 months old child seeming remote.

Altogether, I have been able to find in the literature of appendicitis 80 cases of the disease in infants under 2 years of age. These I have collected and summarized under 4 headings, according to age: 1.—Appendicitis in children under 3 months of age. 2.—In children from 3 to 6 months of age. 3.—Children

from 6 to 12 months; and 4.—Children between the ages of 1 and 2 years.

In the cases occurring among children under 3 months, we find 2 possible instances of prenatal appendicitis. The first was a doubtful case in a newly born baby with an eventration and a hernia into the umbilical cord. The appendix of this patient was removed. The second occurred in the female baby already mentioned who was poisoned by the ingestion of bichloride of mercury and died 40 hours after birth. The autopsy showed that the appendix was congested, twisted, and bound to the cecum by numerous adhesions.

#### INFANTS UNDER 3 MONTHS

Including these 2, we find of the 20 cases in this first group, that 16 were males and 4 females; 10 died and 10 recovered; 8 were associated with strangulated hernia. All showed definite appendicitis. More than half were gangrenous. Nearly all had fever. Tumor in the right iliac region was noted in several of these babies. Vomiting was generally observed. Some were stuporous; some in collapse. In a number of cases diarrhea is recorded; in others, diarrhea followed by constipation. Obstruction of the bowels was frequently noted late in the disease, even in those cases where strangulated hernia was absent. Abdominal distention was a frequent symptom, though in several cases, retraction of the abdomen was described. The appendix is recorded as gangrenous in 8 cases out of this series. In 7 cases the appendix was perforated; in 13 no perforation occurred. It is noteworthy that convulsions occurred in none of these cases under 3 months of age, and that in no instance was there any foreign body found in the appendix. On the other hand, it is very striking to recall the frequency with which appendicitis is associated with strangulated hernia, and to notice that the majority of the cases occurred among male children.

#### INFANTS FROM 3 TO 6 MONTHS

In the second group, *i.e.*, appendicitis in children from 3 to 6 months of age, there were 6 recorded cases. Of these, 4 were males and 2 females. In one case, the disease is thought to have followed a fall, shortly after which a tumor manifested itself in the right hypogastric region. Vomiting was marked in this case. Considerable pus was found in the urine. The patient when ope-



rated presented a localized appendiceal abscess, which was incised and drained. The infant recovered.

In another case in this series, where constipation was a marked symptom, the disease followed an acute follicular enteritis. A large abscess was present in the appendiceal region. The appendix itself was necrotic. After it was removed recovery resulted. Another baby showed vomiting, constipation, fever, restlessness, meteorism, and pain. On operation, the appendix was found perforated; the abdomen contained free pus. Death occurred on the seventh day. Two of the babies in this group showed fecal concretions in the appendix. Of the 6, 3 died and 3 recovered.

#### INFANTS FROM 6 TO 12 MONTHS

In the third group, children from 6 to 12 months, 11 cases are noted. Of this number, 7 were males, 2 were females, and in 2 cases the sex is not given. The symptoms resemble those already given for the earlier series, namely, vomiting, constipation, fever, and tumor mass. In one case a diagnosis of intussusception was made with a tumor mass in the right iliac region. Operation, however, showed a perforated appendix. Death ensued. In another case where the same diagnosis was made, bloody stools, marked pain and abdominal distention were observed. Operation likewise showed a perforated appendix. In this case 2 fecal concretions were found. Death occurred on the eleventh day. One may readily understand that a diagnosis of intussusception would be strongly suggested in a baby who had fever, vomiting, pain, distended abdomen, with constipation and bloody stools. In another case in this series, where appendicitis actually occurred simultaneously with intussusception conditions were corrected by operation, and the patient recovered.

In this series, 7 died, 3 recovered, and the fate of 1 is not stated. Only 2 cases were associated with strangulated hernia. In 2 cases, fecal concretions are reported.

#### INFANTS FROM 1 TO 2 YEARS

In the children from 1 to 2 years, 40 cases are recorded. Thus it is to be noted that there were as many in the second year of life as in the first. Of this number, 25 were males, 8 females, and in 7 no sex is given, thus again showing the preponderance of the disease in males. The usual symptoms were found, tumor mass, vomiting, fever, pain, constipation alternating with diarrhea;

in some cases the disease followed previous gastro-enteritis. In 4 cases in this series, the appendicitis was complicated by strangulated hernia. In one case, the head of a black pin was found in the perforated and gangrenous appendix. It is surprising to note how frequently the appendix was ruptured. In this series, there were 16 deaths, and 18 recoveries; in 6 cases the result was not recorded.

Gundobin (*Besonderheiten des Kindesalter*, 1912) states that the length of the appendix varies. In infancy, the longest are 11.6 cm., the shortest 3.4 cm. With advancing years, the appendix increases in length. In 6 per cent. of infants, the appendix descends into the small pelvis; in about one-third of the cases, it takes an ascending direction. It is also important to note that the appendix lies posterior to the cecum in 22 per cent. of all infants examined, as well as in 11 per cent. of older children. Gundobin thinks that the *valvula Gerlachii* has neither physiological nor pathological significance. He believes that if the appendix is directed upwards and lies behind the cecum, fluid under moderate pressure may be caused to flow into it; whereas if the appendix occupies the usual hanging position, it requires a considerable pressure to force fluids into it. It has been suggested that the funnel-shaped opening of the appendix into the cecum makes it difficult for fecal masses to gain access to the appendix of young infants. Whether the anatomical location of the appendix, or the ease of access of fluids and fecal concretions bears a causal relation to the occurrence of appendicitis in infants, must remain for the present an open question.

In the case analyses already given, I have placed stress upon the symptoms which prevail during the various ages of infantile appendicitis. J. H. Hess (*ARCHIVES OF PEDIATRICS*, 1905) very correctly says that muscle spasm or rigidity of the right rectus muscle may be present early but is difficult to elicit. He points out that nausea and vomiting are usually present a short time before the onset of the pain, though these symptoms tend to cease when the stomach is emptied by vomiting. They tend to reappear later when perforation occurs, when abscess forms, or when intestinal paresis exists.

Manifest chill, which is rare in childhood, is infrequently noticed in the first stage of the disease. Temperature is unreliable. It may be very high, or in some instances it may be sub-

normal. Pulse usually corresponds to the temperature. When extensive peritonitis occurs, the pulse is rapid, weak, and irregular. In adults, as in children, an abatement of severe symptoms sometimes occurs after the perforation of the appendix. A child who has been suffering with high fever, nausea, vomiting, great abdominal distention, and marked discomfort, sometimes feels great relief and shows an apparent improvement immediately after the appendix is ruptured, but such improvement is misleading and has been aptly described by some writers as the period of deceptive calm.

Constipation is the rule and occurs among the more severe types. Diarrhea occurs in the milder types, though both conditions may be present, one alternating with the other. When general peritonitis occurs, and paralytic ileus results, symptoms of bowel obstruction naturally follow.

It has been frequently pointed out that there exists a hereditary predisposition to the disease. Nearly every practitioner knows that in some families almost all of the children at one time or another fall ill with definite attacks of appendicitis. Under such circumstances, it may be assumed that there is a peculiar inherent structural weakness of the lymphoid tissue of the appendix.

Traumatism or diseases of the alimentary tract occasionally seem to play a part in the production of appendicitis. As an instance of traumatism, I may in this place refer to an older child, a young boy who had occasionally complained of pain in the region of the appendix. After a violent game of basket ball, he sickened with acute abdominal symptoms. Perforation of his appendix occurred very rapidly; general peritonitis ensued, and death followed, notwithstanding immediate operative procedure. Traumatism to the abdominal wall must therefore be considered an etiologic factor in the production of acute appendicitis, though it is probable that traumatism can be an exciting cause only where there has been a pre-existing chronic appendicitis. A number of authors insist on the relationship of enteritis to appendicitis in young childhood. We can readily understand that if enterocolitis be present, appendicitis may easily occur.

Infection may take place through the lymphatics, or possibly, in some cases, it may be a direct extension from the cecum. In addition, we know that appendicitis may occur after erysipelas, scarlet fever, pulmonary and pleural infections, tonsilitis, and other diseases. Foreign bodies, such as worms in the appendix,

may bear a direct causal relation. Indeed, Cecil and Burkeley (Jour. of Am. Med. Sci., 1916) think that there is a definite form of appendicitis produced by oxyuris and trichocephalus. They are of the opinion that these parasites produce a catarrhal type of inflammation, and sometimes punctate ulcerations of the mucosa of the appendix.

Van der Bogert calls attention to the frequent association of bladder symptoms with appendicitis. He reports a case in a male child 15½ months old. Examination showed that the urine contained large quantities of pus. Autopsy revealed free pus in the abdomen, a ruptured appendix, normal kidneys, and an empty, congested bladder. It is conceivable that owing to the deeper position of the cecum in the pelvic fossa, that bladder symptoms, such as pain upon urination and tenesmus, retention, and cloudy urine may be present. Pyuria must depend upon a direct extension of the infection from the appendiceal region to the bladder.

The blood examination in almost every case of appendicitis shows a polymorphonuclear leucocytosis. When general peritonitis occurs, or where the general defenses of the body are reduced and exhausted by severe sepsis, the leucocyte count may be low.

The diagnosis in young infants is difficult, and the mortality is high. Furthermore, the precise condition is frequently confused with intussusception, intestinal obstruction, diffuse pneumococcic peritonitis, pleurisy, pneumonia, gastro-enteritis, typhoid fever (rarely), ileopsoas abscess, or coxalgia.

Tenderness at McBurney's point, if it can be elicited, is of diagnostic importance, but, as been already stated, the appendix in childhood frequently lies deep, so that tenderness may be greater on the left than on the right side, or it may be deflected upwards. Rectal examination is of great importance in such cases. Where there is palpable resistance on the right side, in the presence of other symptoms, the diagnosis of appendicitis should be strongly suspected. Kurchmann, who made an analysis of all the cases of appendicitis in young children occurring in the Johns Hopkins Hospital, found that in one child suffering from appendicitis the diagnosis of vesical calculus was made; in another child with appendicitis a diagnosis of tubercular arthritis.

The following table is a collection of 80 cases of appendicitis in children under 2 years of age, setting forth the most important data, which I have attempted to incorporate in this paper.



CASE	AUTHOR	PUBLICATION	SEX	AGE	SYMPTOMS; DIAGNOSIS	ANATOMICAL LESIONS	RESULT
1	Holmes	British and Amer. J of Med. and Phys. Sci., May, 1847.	M.	20 mos.	Fever; constipation, tenderness; rigidity.	Inflammation of the intestines near the cecum; perforated appendix; concretions.	Death.
2	Battersby	Dublin Med. Jour., 1847, p. 515.	M.	6 mos.	Vomiting; tumefaction in rt. hypogastric region; following a fall. Thigh flexed on abdomen. Diag: perityphilitic abscess.	Pus evacuated by incision; and also pus discharged in the urine.	Recovery.
3	Betz	Memorabilien, 1870, 15, 118.	M.	7 mos.	Pain; constipation; tenderness; vomiting.	Autopsy: inflammatory exudate in ileo-cecal region; appendix adherent to ileum, perforated, 3 concretions.	Death.
4	Monks	Bos. Med. and Surg. Jour., June 5, 1880, 543.	M.	13 mos.	Diag: Scrotal hernia.	Operation: appendix abscessed in scrotum. No perforation.	Recovery.
5	Silbermann	Schlesischen Gesellschaft f. vaterlaendische Kultur., Seance of July 20, 1882.		Last period of lactation.	Symptoms of appendicitis.	Appendicitis with exudate.	
6	Demme	XXII., Med. Bericht, u. Thätigkeit., 1885.	F.	7 wks.	Fever; tympanitis; tenderness; general peritonitis.	Autopsy: diffuse peritonitis; appendix dilated, filled with solid fecal particles (undigested porridge).	Death.
7	Tordens	Gaz. Hebdomad. 1885, p. 772.	M.	6 mos.		Perityphilitis.	
8	Cleveland	Lancet-clinic, 1887, 19, 7.	M.	3 mos.	Fever; thigh flexed; later-mass in rt. iliac fossa. Diag: appendicitis.	Incision made: perityphilitic abscess.	Recovery.
9	Summers	Phil. Med. News, 1891, 59, 513.	M.	21 mos.	Fever 104°; rapid pulse; colic; vomiting; constipation.	Operation: enlarged gangrenous appendix; 3 perforations; appendix in an abscess containing 3 drams pus.	Recovery.

CASE	AUTHOR	PUBLICATION	SEX	AGE	SYMPTOMS; DIAGNOSIS.	ANATOMICAL LESIONS	RESULT
10	Pollard	Lancet, 1895, I., 1,114.	M.	6 wks.	Scrotal hernia.	Operation: hernia of appendix into scrotum abscess; no perforation.	Recovery.
11	Hauck	Med. Reviews, 1895, 31, 463.	F.	16 mos.	Diag: Intussusception.	Operation: appendix strangulated by coil of small intestine.	Recovery.
12	Gordon	Thésé de Paris, 1896.	M.	2 yrs.	Diag: Abscess.	Operation: perforated appendix.	Recovery.
13	Taylor	Bos. Med. and Surg. Jour., 1897, 482.	M.	1 yr.	Diag: Intussusception.	Operation: appendix perforated.	Death.
14	Savage	N. Y. Med. Rec., Apr. 23, 1898, p. 600.	M.	61 days	Scrotal hernia.	Operation: appendix in scrotum; perforated; removed.	Death.
15	Weiss	Revue de Chir., 1898, p. 599.	M.	20 mos.	Sudden onset; pain in rt. iliac fossa; fever, vomiting; rigidity 5th day; distention; fluctuation.	Operation on 7th day: abscess; unable to find appendix. No autopsy.	Death.
16	Millon	Arch. de Med. des Enfants, 1899, II., 285.	F.	19 mos.	Fever; diarrhea. Appendicular abscess.	Abscess incised; app. not found; stercoral concretions discharged later.	Recovery.
17	Kottman	Correspl. f. Schweizer Aert., 1899, p. 753.	M.	2 yrs.	Previously had strangulated hernia; vomiting; pain; internal strangulation.	Operation: general purulent peritonitis; appendix perforated; resected; drained.	Recovery.
18	Goyens	Ann. de la Soc. Med. Chir. de Liege, Apr., 1900.	M.	6 wks.	Diarrhea; tumor in rt. inguinal region.	Autopsy: gangrenous, perforated appendix; septicaemia.	Death.
19	Blumer and Shaw	Arch. Ped., 1901, 18, 592.	M.	7 wks.	Weighted 6 lbs. 6 oz.; gen. anasarca; stuporous; weak; edematous.	Autopsy: Acute gangrenous app.; abscess between app. and sigmoid flexure; enlarged liver and kidney; edema brain.	Death.
20	Elder	Montreal Med. Jour., Mar., 1901, p. 201.	M.	7 wks.	Fever; vomiting. Strangulated hernia.	Operation: acute appendicitis, and gangrenous, app. removed.	Recovery.

22	Newton	J. A. M. A., 1901, 36, 1,477.	M.	23 mos.	Distention; fever; induration in rt. iliac fossa; pain. Diag: appendicitis.	Operation: appendiceal abscess.	Recovery.
23	Griffith	Arch. Ped., 1901, 18, 751.	F.	3 mos.	Collapse; rapid pulse; distention; constipation followed by diarrhea.	Autopsy: turbid fluid and lymph in peritoneal cavity; app. 6 cm.; gangrenous; old lesions.	Death.
24	Krassnobajeriv	Djet Skala Medizina, 1902.	M.	5 mos.		Appendicitis.	Death.
25	Schüle	Beitrag zur Perityphlitis im Kindesalter, 1902.	F.	1 yr.	Vomiting, distention, fever; pain in ileo-cecal region. Diag: perforative peritonitis.	Operation 4th day: pus with fecal odor; appendix adherent; not removed.	Death 5th day
26	Schüle	Same.	F.	5 mos.	Fever, restlessness; constipation; vomiting; meteorism; pain.	Autopsy: purulent exudate in abdomen; abscess rt. iliac fossa; app. perforated; stercoral calculus.	Death 7th day.
27	Schüle	Same.	M.	2 yrs.	Vomiting; constipation; 4th day: meteorism, pain in ileo-cecal region. Diag: Int. obstruction.	Operation 4th day: sero-purulent fluid in peritoneum; appendix adherent, perforated at base, contained stercoral calculus.	Death 8 hrs. after op.
28	Ténon	Bull. et Mem. Soc. de Chir. de Paris, 1902, 28, p. 858.	M.	8 mos.	Diag: strangulated hernia. Tympanitis; vomiting.	Appendicitis and strangulated hernia of the cecum. App. inflamed; contained pus.	Recovery.
29	Gyr	Thésé de Lu- zanne, 1903.	F.	18 mos.	Vomiting, pain, fever; distention; rigidity; pain in right iliac fossa. Rec. exam: indefinite resistance to rt. Diag: appendicitis.	No autopsy or operation.	Death 11th day.
30	Gyr	Same.	F.	18 mos.	Tumor mass; vomiting, fever, pain.	Autopsy: free end of appendix involved in abscess.	Death 2 mos. from onset.
31	Gyr	Same.	F.	21 mos.	Habitual constipation; vomiting, distention, rigidity. Diag: appendicitis.	No operation. Autopsy: appendix adherent to cecum; perforated, surrounded by pus. Multiple adhesions.	Death in second week.
32	Jackson	Am. J. Med. Sci., Apr., 1904, p. 710.	F.	Pre-natal	Died from mercury poisoning, 40 hrs. after birth.	Autopsy: appendix congested, twisted, bound to cecum by numerous adhesions.	Death due to poisoning.

CASE	AUTHOR	PUBLICATION	SEX	AGE	SYMPTOMS; DIAGNOSIS	ANATOMICAL LESIONS	RESULT
33	McCosh	J. A. M. A., Sept. 24, 1904.		12 mos.		Appendicitis.	
34	McCosh	Same.		12½ mos.		Appendicitis.	
35	McCosh	Same.		16 mos.		Appendicitis.	
36	McCosh	Same.		20 mos.		Appendicitis.	
37	Howland	Arch. Ped., 354. 1904, 21.	M.	22 mos.	Vomiting, fever 104°; pain; rigidity; tenderness; induration. Diag: appendicitis.	Operation 5th day: app. perforated; abscess.	Recovery.
38	Howland	Same.	M.	21 mos.	Fever; pain; vomiting; rigidity; tenderness; induration. Diag: appendicitis.	Operation: diseased appendix, surrounded by 2 oz. pus.	Recovery.
39	Albrecht	Presse Med., Dec. 9, 1905, p. 798.	M.	1 mo.	Moribund.	Autopsy: general pur. peritonitis; multiple abscesses in iliac fossa; app. large and long, adherent to cecum; perforated; pus contained coli bac. and streptococci.	Death.
40	Albrecht	Same.	M.	3 mos.	Occasional attacks of fever; fluctuating mass. tumor.	Autopsy: large abscess perforated app.; appendix twisted, elongated, adherent to colon; coli bacilli and staphylococci.	Death.
41	Glazebrook	N. Y. & Phil. Med. Jour., Mar., 1905, 483.		14 mos.	Chill, cyanosis; pain.	Autopsy: ruptured appendix; gangrenous; contained head of black pin.	Death In few hrs.
42	Bamberg	Inaugural Diss., 1905.	M.	5 wks.	Diarrhea; fever. Eruptive fever 2 weeks previous.	Autopsy: purulent exudate on rt. side cavity. Appendix size of pencil, twisted, adherent, grayish, contained pus; ulcerated; mesenteric ganglion enlarged; coli bac. and chains of Gram neg. cocci.	Death.
43	Broca	British J. Ch., Dis., 1906, 3, 231.		20 mos.	Enterocolitis localized in appendix.	No Statistics.	



44	Kermission and Guil- bellot	Revue de Chlr., 1906, 34, 441.		11 mos.	Fever; vomiting, pain, disten- tion, bloody stools, enormous abd. enlargement at base thorax; pain in rt. iliac fossa.	Operation 3rd day: sero-purulent fluid in cavity; appendix friable, inflamed; 6 to 7 cm. long; perforated; 2 fecal concretions.	Death 7 3rd day.
45	Berkholz	Monatschr. f. Kinderhik., Juno, 1908, 7, 133.	M.	1½ yrs.	4th attack of vomiting, fever, pain. Diag: appendicitis.	Operation: ulcerated appendix.	Recovery.
46	Deiss	Inaugural Diss., 1908.	M.	2 yrs.	Fever; W. B. C. 23,000; appen- diceal sympt. Diag: appendix.	Operation: localized abscess; tumor on ap- pendix; appen. inflamed.	Recovery.
47	Deiss	Same.	F.	2 wks.	For 8 days vomiting. Enteritis; fever; abd. sunken.	Autopsy: enteritis; acute appendicitis; peritonitis; pus in the proximal end of ap- pendix.	Death 11th day from onset.
48	Deiss	Same.	M.	10 mos.	Fever; abd. tenderness; pain in rt. quadrant. Tumor mass; dis- tention. Diag: invagination.	Operation: large appendiceal abscess.	Recovery.
49	Deiss	Same.	M.	20 mos.	Fever; constipation; rigidity; tumor.	Operation: appendiceal abscess.	Death.
50	Deiss	Same.	M.	22 mos.	Obstipation; acute int. disturb- ance; classic symptoms of app. Diag: appendicitis.	No operation.	Recovery.
51	Deiss	Same.	M.	23 mos.	Tumor mass in rt. hypogastrium.	Operation: cecum high; peritonitis; sub- hepatic abscess; unable to find appendix. Autopsy: gen. pur. peritonitis; appendix perforated; embedded in adhesions in region of gall-bladder.	Death.
52	Deiss	Same.	M.	23 mos.	Nausea; green vomitus; fever; rapid pulse; dullness on rt. side; resistance on rt. side. Diag: ap- pendicitis.	No operation.	Recovery.
53	Lillenthal	J. A. M. A., 1908, 51, 475.	M.	3 wks.	Hernia; tumor in rt. inguinal region; nausea; mass in scro- tum. Abdomen swollen; rigidity.	Operation: appendix found in the sac, ad- herent, gangrenous; coli bac.	Recovery.
54	Dixon	Ann. Surg., 1908, 47, 57.	M.	24 days	Diagnosis: Strangulated ingui- nal hernia.	Operation: part of cecum and ileum and the appendix in hernial sac; appendix ad- herent to sac and gangrenous.	Recovery.
55	Schellong	Med. Klin., 1908, 4, 722.		21 mos.	Classical symptoms of appendici- tis and diffuse peritonitis.	Operation: diffuse purulent peritonitis; autopsy: appendicitis and pur. peritonitis.	Death.

CASE	AUTHOR	PUBLICATION	SEX	AGE	SYMPTOMS; DIAGNOSIS	ANATOMICAL LESIONS	RESULT
56	Churchmann	Bull. Johns Hopkins Hosp., 1909, 20, 31.	M.	19 mos.	Diag: rt. acquired strangulated inguinal hernia.	Operation: free fluid in sac; loops of ileum and cecum with appendix.	Recovery.
57	Aisberg	Arch. f. Kinderhik., 1909, 1, 252.	M.	6 mos.	Diag: Appendicitis.		
58	Gray	Ped., 1910, 22, 797.	M.	2 mos.	Tender mass in inguinal sac.	Operation: solid mass in a rt. inguinal hernial sac, imbedded in which was the distal half of appendix; appendix inflamed, kinked, ulcerated.	Recovery.
59	Archer	Jour. Roy. Army Med. Corps, 1911, 16, 307.	M.	8 mos.	Diag: acute intussusception.	Operation: intussusception complicated by appendicitis; appendix constricted and ulcerated.	Recovery.
60	Collinson	Practitioner, 1911, 2, 61.	M.	20 mos.	Chill; pain; fever; tumor in rt. iliac fossa.	Operation: on 7th day: appendix thickened and inflamed; concretions; abscess on cecum.	Recovery.
61	Zoege	Inaugural Diss., 1911.	F.	1 yr.	Symptoms of peritonitis and perityphilitis.	Autopsy: 5 perforations of appendix; inflamed mesenteric glands; gangrenous peritoneum.	Death.
62	Zoege	Inaugural Diss., 1911.	M.	10 mos.	Symptoms of rt. inguinal hernia, peritonitis, appendicitis.	Operation: diffuse purulent peritonitis; multiple abscesses; perforated appendix.	Death.
63	Zoege	Inaugural Diss., 1911.	M.	15 mos.	Symptoms of peritonitis from appendix.	Operation: diffuse purulent peritonitis; appendicitis; enteritis; 2 perforations of app.	Death.
64	Zoege	Inaugural Diss., 1911.	M.	14 mos.	Symptoms of perityphilitis; peritonitis; gastroenteritis.	Autopsy: diffuse purulent peritonitis; gangrenous appendix, 7 cm. long. Ulcers and perf. of appendix. Fecal concretions.	Death.
65	Zoege	Inaugural Diss., 1911.	M.	2 yrs.	Symptoms of perityphilitis; peritonitis.	Operation: diffuse purulent peritonitis; perforated appendix; fecal concretions.	Death.
66	Zoege	Inaugural Diss., 1911.	F.	15 mos.	Symptoms of peritonitis and appendicitis.	Autopsy: perforated appendix; fecal concretions; purulent peritonitis; large abscess; gangrene appendix.	Death.
67	Kornblüh	N. Y. M. J., 1911, 1, 529.	M.	21 mos.	Diag: rt. inguinal hernia.	Operation: appendix 4 in. long; contained 8 pin-worms and a caraway seed.	Recovery.

68	Marvel	M.	Arch. of Ped., 1912, 29, 366.	6 mos.	Diag: appendicitis.	Operation: appendix enlarged; contains fecal concretion.	Recovery.
69	McPherson		Bull. Lying-In Hosp. N. Y., 1912, 8, 67.	15 hrs.		Autopsy: appendix adherent to posterior aspect of cecum.	Death.
70	Mitchell		B. J. Dis. Ch., 1912, 9, 355.	14 mos.	Abdominal tenderness and rigidity.	Operation: appendiceal abscess.	Death.
71	Canagular; Hamil	M.	Bull. Soc. Ped., 1912, 14, 45.	5 days	No bowel movement; abdominal tenderness; tumor mass in rt. iliac fossa. Diag: intestinal occlusion.	Operation: acute peritonitis; appendix long; twisted, necrosed, adherent; no perforations.	Death
72	Remsen	M.	Ann. Surg., Dec., 1912.	16 days	Vomiting; hernia in rt. inguinal region; pain.	Operation: appendix in hernial sac, inflamed, 8 cm. long, adherent.	Recovery.
73	Cumston	M.	Med. Rec., Dec. 7, 1912.	12 wks.	Diarrhea; distention; dullness over rt. iliac fossa; mass in cecal region; vomiting.	Operation: foul fluid; cecum distended; appendix twisted, infected; removed.	Recovery.
74	Cumston	M.	Med. Rec., Dec. 7, 1912.	21 mos.	Constipation; vomiting, colic, distention; tympanitis.	Operation: thin serum and flakes of fibrin; general peritonitis; gangrenous appendix.	Death.
75	Becker	M.	Arch. f. Kinderheilk., Oct. 12, 1912.	2 mos.	Swelling of left inguinal region; distention; rigidity; fever, Diag: incarcerated hernia.	Operation: appendix gangrenous. Other organs in proper place.	Recovery.
76	Reed		J. A. M. A., 1913, 61, 199.	New-born	Disemboweled at birth; appendix red, contused and swollen.	Operation: appendix removed and intestines replaced.	Recovery.
77	Wilbouchewitch	F.	Soc. de Ped., Oct., 1913.	2 yrs.	Irregular pains for 10 days.	Operation: small foreign body in appendix.	Recovery.
78	Pholip	F.	Arch. de Med. des Enf., 1914.	13 mos.	Constipation; later diarrhea; fever, pain; mass in rt. iliac fossa. Diag: appendicitis or Intussusception.	Operation: appendiceal abscess and ster-coral concretion.	Recovery.
79	Van der Bogert	M.	Arch. of Ped., 1916, 33, 772.	15½ mos.	Vomiting, fever; large amt pus in urine; abdominal distention; tenderness.	Autopsy: free pus in abdomen; appendix ruptured; fecal concretion; kidneys normal; bladder slightly congested.	Death.
80	I. A. Abt	M.	Read at Meeting of Am. Ped. Soc., 1916.	9 mos.	Slight respiratory symptoms; abdominal neg.; fever; rapid pulse.	Autopsy: acute, gangrenous appendicitis with perforation; peritonitis; bronchopneumonia; congestion of kidney and spleen.	Death.

# THE EFFECT OF CHILLING ON EXPERIMENTAL PYELONEPHRITIS IN THE RABBIT\*

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In a recent publication Helmholz and Beeler<sup>1</sup> showed that colon bacilli isolated from cases of pyelocystitis produced focal lesions in the kidney of the rabbit in only a relatively low percentage of cases. In only 8 of 66 animals injected did the colon bacilli show any selective tendency to localize in the kidney. The tendency to produce kidney lesions was more evident when a mixture of colon bacilli and streptococci were injected. This second series of animals was too small, however, to draw any very definite conclusions. It seemed of interest to determine whether there were other factors that might influence the localization of the colon bacilli in the kidney. The first factor to suggest itself was chilling, because of the frequency with which nephritis develops after chilling and because of the fact that pyelitis occasionally follows chilling.

In the earlier experiments the animals were chilled immediately after intravenous injection, in the later from 3 to 4 hours after injection, because it was considered that after the bacteria had been scattered around in the different organs the effect of the chilling would make itself more manifest. In the first series of experiments several strains of colon bacilli were used. In the second series of animals a streptococcus isolated from a human case of pyelitis was used. Twenty experiments were carried on with colon bacilli and 9 with streptococci.

The technique employed was the same that as used by Helmholz and Beeler.<sup>1</sup> For 24 hours before injection the animals were put on bread and water diet to render the urine acid. In every instance the urine was examined before injection for pus cells and albumin. The animals were injected into the ear vein with  $\frac{1}{2}$  to 1 c.c. of a bacterial suspension of broth cultures. At intervals varying from a few minutes to 4 hours after the injection the animals were thoroughly wetted and exposed in a cold room before

\* From the Otho S. A. Sprague Memorial Institute Laboratory of the Children's Memorial Hospital, Chicago.



an electric fan for periods varying from 10 minutes to an hour. In order to control the effect of the chilling 2 animals in each series were chilled without a previous intravenous injection. None of these animals showed any effects in the urinary tract from the chilling, nor, so far as we could tell, did they suffer in any way. The colon bacilli used in these injections were all recently isolated from acute cases of pyelitis. The streptococci were isolated from a case of pyelitis that was of some standing.

The results of the experiments with colon bacilli have been tabulated in Chart 1. Of the 20 animals injected, 4 should be excluded, because they all died within the first 24 hours. Of the remaining 16, 8 showed at one time or other a considerable amount of pus in the urine. Of these, R M 8 showed a large number of pus cells for a period of about 3 days, they gradually decreased so that in several days the urine contained no pus. Then for a period of about a week there was a large number of pus cells, both single and in groups, and this condition prevailed until the time of death. The autopsy and microscopic examination showed no evidences of pathologic change in the kidney.

The second case with pus in the urine showed at autopsy streaks that resembled medullary abscesses but on histologic examination these were seen to be due to chronic nephritis. In a third case, R 22, the pus in the urine was found to have been an admixture from an acute endometritis. A fourth animal, R 26, that showed numerous pus cells in the urine following the injection, lived two weeks longer than any of the other animals that showed abscesses of the more acute type. At autopsy there were no pus cells in the urine and the kidney lesions were of a subacute or even chronic type. The character of the lesions made it practically impossible to decide whether they were the result of the injection or not.

Of the other 5 animals that showed pyuria, 4 had medullary abscesses, 1 cortical abscesses, and 1 definite evidence of a pyelitis. The last animal was the same that showed the cortical abscesses. Of the 3 animals that showed pus in the urine without definite kidney lesions histologically, 1 with acute endometritis must be definitely excluded. The other 2, especially R M 8, referred to above, might have shown some kidney lesions if more extensive histologic study of the kidney had been made. We make this statement because in other instances where the pelvis has been found distended with pus at autopsy, it has been difficult to

demonstrate histologic changes in the kidney tissue in the sections studied, contrary to all expectations. Experiments R 21 and R 23 are of special interest because of the extensive hemorrhages that were seen in the medulla. Small hemorrhages were seen on the surface of both kidneys and on the cortex. The portion adjoining the cortex was a typical burgundy red color, that ran down in small streaks toward the papilla. In experiment 23 with these hemorrhagic areas, there was necrosis of the epithelium with leukocytic infiltration, surrounding large masses of bacteria. In the kidney of R 21 no such areas of infiltration were seen. Both of these animals lived over 24 hours, but less than 48 hours. Five of the animals injected showed a cholecystitis of varying degrees of intensity, 1 an appendicitis, 2 pneumonia and 1 an acute edometritis.

It will thus be seen from the figures that 4 and possibly 5 (R 21) of the 16 animals, that lived at least 24 hours, showed definite inflammatory changes in the kidney. R 21 showed very extensive hemorrhages of the medulla without, however, any inflammatory changes. Thus in about 25% of the animals injected, kidney lesions were produced.

At the time that we carried on these experiments it did not occur to us to make a sufficient number of control injections, without chilling. At a later date it was impossible to do this because fresh cultures were no longer available from these same cases of pyelitis. However, the large series of cases reported by Helmholtz and Beeler<sup>1</sup> can readily serve as control experiments for this series.

This series of 20 experiments tends to show that chilling has a definite effect in producing kidney infection.

The results of the experiments with intravenous streptococci injection followed by chilling have been tabulated in Chart 2. Two animals, R 17.9 and R 17.10, were injected with the streptococci and were not chilled. The first animal showed a negative urine until about 2 weeks after injection when a small number of pus cells were found in the low power field. The autopsy was done about a week later and showed negative findings of the kidney and urinary tract. On microscopic examination, however, there were numerous small abscesses in the medulla. The pelvis showed no inflammatory change. The second control, R 17.10, showed on one day a few pus cells and at no other time during the month following the day of injection were there any pus cells

in the urine. At autopsy, too, the kidney showed nothing abnormal. On microscopic examination, however, there were seen numerous longitudinal abscesses in the medulla and an excess of eosinophile cells. In this connection, it is of interest to note that the changes found in the medulla in these 2 cases resemble the changes that one usually sees in positive cases during the first 4 or 5 days following an injection. If there had been any lesions in other organs at autopsy it might be supposed that the organisms localized elsewhere and secondarily involved the kidney; but in neither instance was this the case. It is rather difficult, therefore, to explain the acute nature of the infiltration in view of the fact that it was almost a month after the injection in each case that the animals were sacrificed.

Of the 7 animals that were injected with streptococci and later chilled, all showed pus cells in the urine at one time or another. Of the 7 animals, 2 showed medullary abscesses, and 2 a pyelitis, unilateral in the one instance and bilateral in the other. None of the 3 remaining animals presented any lesions on histologic examination. This is the more remarkable because 2 of them showed a large number of pus cells in the urine. Taking up the animals that showed pus in the urine but no pathologic findings, it is barely possible that the condition was practically healed before the time of post mortem examination. In animal R 17.12 3 days after the injection and chilling, the urine was loaded with pus cells, single and in groups, and the smear showed a large number of streptococci. Then for a period of about 2 weeks the urine constantly contained pus cells and a few casts. For a short period the pus decreased, to increase again and remain constant up to the time of death. At autopsy the bladder was filled with urine containing only a relatively small number of pus cells. There was nothing in the genital tract to explain the large amount of pus and there was nothing in the histologic examination of the urinary tract to account for the pus.

R 17.8 showed a large number of pus cells and casts beginning 2 days after injection until the time of death. At autopsy the vagina and urethra were entirely negative. The bladder, however, showed several small hemorrhages. The kidneys and ureters, on the other hand, showed no inflammatory infiltration.

R 17.4, the third of these cases, showed pus in the urine beginning about 10 days after the injection, then for a period of about 2 weeks it showed a considerable number of pus cells



which later disappeared. On histologic examination the only thing found was an increased number of eosinophiles in the glomeruli.

Thus of the 7 animals injected, 4 showed definite kidney lesions, 2 of the medulla, 2 of the pelvis. The other 3 showed pyuria for varying periods of time. No definite cause could be found for this pyuria at autopsy in either the urinary or genital tract. As indicated in the chart in one of these animals there were extensive hemorrhages into the muscles of the thigh, a second had pericarditis and a third endometritis.

The fact that the 2 control animals also showed lesions makes it rather difficult to say how much effect the chilling had in producing kidney lesions in this series.

In all the work our efforts have been directed toward producing pyelonephritis with some degree of constancy. This is absolutely essential for a study of the development and treatment of this condition. We have recently found a colon bacillus<sup>2</sup> that localized in the kidney tissues of the rabbit quite constantly; therefore, we did not feel justified in extending these experiments any further. This strain of colon bacillus was isolated from a spontaneous pyelitis of the rabbit and the incidence of kidney takes was almost 70%. This observation is naturally of the utmost significance. It seemed of interest, however, to call attention to the definite tendency of a streptococcus isolated from a human pyelitis to produce kidney lesions. This tendency was very much more marked than in any colon organism that we have so far isolated from a human case of pyelitis. This tendency of the streptococcus to produce kidney lesions also is of great interest. In this series, as in a previous one, we found that one of the cases of pyelitis was unilateral, showing that conditions may be sufficiently different in the two kidneys to produce lesions in one and leave the other one entirely unharmed.

*Summary.*—In a series of 20 intravenous injections of colon bacilli followed by chilling, about 25% showed focal lesions in the kidney, as compared with 12% of those receiving merely intravenous injection. (Helmholz and Beeler.)

Secondly, a streptococcus isolated from a case of pyelocystitis showed in 66% of the animals injected focal lesions in the kidney.

1.—Helmholz and Beeler: Focal Lesions Produced in the Rabbit by Colon Bacilli Isolated from Pyelocystitis Cases, *Am. Jour. of Dis. of Child.*, Vol. XIV., 1917, 5-24.

2.—Helmholz and Beeler: Experimental Pyelitis in the Rabbit, *Jour. Am. Med. Ass'n.* Vol. LXIX., 1917, p. 898.





PROTOCOLS OF EXPERIMENTS

R M 8.—Dec. 7. Injection into the ear vein of  $1\frac{1}{2}$  c.c. of a suspension in 5 c.c. NaCl of broth culture of B coli from S.

Wet thoroughly in cold water and held before the fan for 15 minutes.

Dec. 8. Urine examined: negative, temperature  $40.6^{\circ}$ .  
Diarrhea.

Dec. 9. Urine examined: negative. Diarrhea.

Dec. 11. Urine examined: negative.

Dec. 12. Many pus cells are seen in urine. Catheterized specimen contains many pus cells, groups of cells and epithelial cells. Temperature  $39.6^{\circ}$ . Urine cultured.

Dec. 13. Fewer pus cells in urine. Many epithelial cells. Temperature  $39.5^{\circ}$ .

Dec. 14. No pus cells in urine.

Dec. 18. No pus cells in urine.

Dec. 19. Urine negative.

Dec. 20. Urine negative.

Dec. 21. Many pus cells and groups of cells in urine. Temperature  $39.4^{\circ}$ .

Dec. 29. Urine shows 10-15 pus cells in low power field.

Dec. 29. P.M. Animal found dead and put on ice.

Dec. 30. *Autopsy*—The kidneys are apparently negative and there are no gross changes in any other organs.

*Microscopic Examination*—Left kidney. There is marked swelling of the convoluted tubules. No excess of cells is seen in the glomeruli. There are no areas of infiltration in the cortex or in the medulla. The pelvis is empty and the mucous membrane shows no infiltration with leukocytes. The right kidney resembles the left, except that there is more congestion of the cortex.

R. M. 9.—Dec. 13. Urine examined: Entirely negative. Injected intravenously with 1 c.c. heavy suspension of S. culture. Temperature before inoculation  $38.4^{\circ}$ . After inoculation the rabbit's fur was wet with cold water and animal then held before fan for 60 minutes. Temperature afterwards is  $38.7^{\circ}$ .

Dec. 14. Urine examined: negative, temperature  $38.5^{\circ}$ .

Dec. 15. Urine examined: negative.

Dec. 18. Urine examined: negative.

Dec. 19. Urine examined: Slight excess of pus cells; temperature  $38.8^{\circ}$ .

Dec. 20. Urine examined: About 6 pus cells to low power-field.

Dec. 21. Urine examined: An occasional pus cell. Expressed urine shows 5-10 pus cells and few casts.

Dec. 29. Urine examined: 3-4 pus cells.

Dec. 30. Urine examined: 5-6 pus cells.

Jan. 3, '17. Urine examined: negative.

Jan. 4. Urine examined: 4-5 pus cells.

Jan. 5. Urine examined: Negative.

Jan. 8. Urine examined: Slight excess of pus cells. An occasional hyalin cast.

Jan. 8. Sacrificed.

*Autopsy*—The kidneys are a brownish red color, perfectly smooth externally. On section of the kidney the relation of the cortex and medulla appears normal, but running down through the lower portion of the cortex and down into the medulla are numerous white opaque streaks, which in no part reach more than a third of the way through the medulla. The pelvis is normal. Culture of the bladder urine is negative.

*Microscopic Examination*—Kidney. The cortex shows numerous streaks rich in lymphocytes showing an excess amount of connective tissue, with destruction of the parenchyma. The process apparently is subacute or chronic. The cells are practically all of the lymphocytic type. The medulla shows marked congestion and a few dilated tubules and a few areas in which there is some increase in cells about the tubules. These are also the lymphocytic type. The pelvis is empty, and the wall shows no infiltration.

R M 10.—Dec. 12. Urine examined: Entirely negative. Injected intravenously with 1 c.c. heavy suspension of organism from broth culture of P.

Temperature before injection 38.5°. Wetted and held before fan for 10 minutes. Temperature after that is 38.9°.

Dec. 14. Urine examined: Negative. Temperature 38.9°.

Dec. 15. Urine examined: Negative.

Dec. 17. Dead.

*Autopsy*—Dec. 18. The bladder is distended with dark-colored urine. Examination of this shows epithelial cells, otherwise negative. The kidneys are negative. The stomach contains a

small ulcer. A purulent cholecystitis is present. The bladder is negative and also the culture.

*Microscopic Examination*—The kidney shows nothing abnormal in the cortex, medulla and pelvis.

R M 11.—Dec. 13, '16. Urine examined: Entirely negative. Injected intravenously with 1 c.c. heavy suspension of organism from broth culture of P. (B. coli.) Before injection the temperature 38.4°. Cold shower and then held before fan for 10 minutes. Temperature afterwards 38.8°.

Dec. 14. Urine examined: Negative. Temperature 38.4°.

Dec. 15. Urine examined: Negative.

Dec. 18. Urine examined: Negative.

Dec. 19. Urine examined: Negative.

Dec. 20. Urine examined: Negative.

Dec. 21. Urine examined: Negative.

Dec. 22. Urine examined: Negative, except for an occasional pus cell.

Dec. 28. Urine examined: 1-2 pus cells and several casts.

Dec. 29. Urine examined: 40-50 pus cells and several casts. Rabbit is sick.

Jan. 3, '17. Urine examined: Negative. Rabbit ill, died 30 minutes later. Sacrificed.

*Autopsy*—Some coccidiosis of the gall bladder. Otherwise entirely negative. Cultures of the gall bladder and bladder made.

Jan. 4. Culture of the bladder is negative. Culture of the gall bladder shows gram negative bacilli.

*Microscopic Examination*—In areas running through the lower portion of the cortex there is considerable increase in young connective tissue. The cortex is otherwise negative. The medulla and pelvis show nothing abnormal.

R M 12.—Dec. 22, '16. Urine normal. Injected intravenously with 2 c.c. of a suspension of B coli from urine of R M 8. Chilled for one hour after injection.

Dec. 23. Found dead in cage.

R M 13.—Dec. 22. Urine normal. Injected intravenously with 2 c.c. moderate suspension of B coli from urine of R M 8. Chilled for one hour after injection.

Dec. 29. 10-15 pus cells to low power field in urine.

Dec. 30. 1-2 pus cells in urine.



Jan. 3, '17. No pus cells in urine.

Jan. 4. An occasional pus cell in urine.

Jan. 5. An occasional pus cell in urine.

Jan. 8. Large excess of pus cells in urine—many groups. Temperature 39.5°. Sacrificed.

*Autopsy*—The kidneys are yellowish brown in color and both show scattered small hemorrhages over the surface. On section the cortex is of a grayish yellow color. In the medulla there are a number of opaque yellowish dots and streaks running toward the papilla. A portion of the medulla about the papilla is injected and shows numerous yellowish streaks running toward the point of the papilla. Culture of the bladder urine is negative. Autopsy is otherwise negative.

*Microscopic Examination*—Kidney. The cortex shows several areas of definite sclerotic changes with increase in connective tissue and infiltration with lymphocytes. The cortex is markedly congested and there is no increase in the number of cells in the glomeruli. Nowhere is there any acute infiltration in the cortex. In the medulla, on the other hand, in several streaks there is an acute infiltration with leukocytes and a breaking down of tissue. The pelvis is empty and the mucosa shows no infiltration with cells.

R M 14.—Dec. 22. Urine examined: Negative. Injected intravenously with culture from urine of R M 8 and chilled for one hour.

Jan. 3, '17. Urine examination: negative. Animal is very thin and looks ill.

Jan. 4. Urine contains 1-10 pus cells in low power field. Temperature 39.5°.

Jan. 5. No specimen of urine obtained. Temperature 38.6°. Left hind leg is tender. Sacrificed.

*Autopsy*—The findings are entirely negative except for fracture of the femur. Bladder urine contains epithelial cells and cellular debris. Culture of the urine is negative.

*Microscopic Examination*—No changes in the pelvis of the kidney or in the kidney substance were found.

R M 15.—Dec. 22. Urine examined: Negative. Injected intravenously with culture from urine of R M 8. Later chilled for one hour. Urine examined daily: negative entirely.

Dec. 29. Died.

*Autopsy*—Rabbit is very emaciated. On opening the peritoneum, the stomach and edge of the liver are adherent to the gall bladder by a thick yellowish-white exudate. The colon at the ileocecal valve is swollen and edematous and hemorrhagic for an extent of about 2 inches. The small intestine is filled with fluid content and considerable amount of air. The bladder is distended with clear urine. Kidneys are a brownish yellow color and smooth. On section the markings are normal. There is no evidence of a pathologic condition in the cortex, medulla or pelvis.

*Microscopic Examination*—The cortex shows a slight excess of eosinophiles in the glomeruli. There are no areas of infiltration in either the cortex or medulla. The pelvis is empty and the lining mucous membrane shows no infiltration.

R 8.—Dec. 23, '16. Urine normal. Intravenous injection of 5 c.c. of suspension of 2 tubes of 18-hour broth growth from F. Chilled 3 hours later for 1 hour.

Dec. 26. Animal is much emaciated and very weak. No urine obtained.

Dec. 27. Animal is weak. Expressed urine shows about 200 pus cells to low power field.

Dec. 28. Animal is stronger than on Dec. 27. No urine obtained. Sacrificed.

*Autopsy*—Animal is markedly emaciated. Temperature 37°. On opening the peritoneum the left kidney is seen to lie in groove of the spine. The bladder contains a small amount of urine. The stomach and colon are adherent to the gall bladder, which is covered with a dense whitish exudate. The heart and lungs are negative. The stomach and intestinal canal are also negative. The gall bladder is markedly thickened and the wall shows signs of coccidiosis. *Right kidney* is of a reddish yellow color and the surface is studded over with small yellow opaque areas, single and in large groups. The capsule strips readily. On section these opaque yellow areas extend down to the papilla, as opaque yellowish lines, single and in groups. The pelvis contains a thin purulent exudate but no macroscopic change. The ureter on the right side is slightly distended and a purulent material can be expressed that contains numerous cells and innumerable bacilli. The left kidney resembles in every way the right. The bladder

shows no hyperemia or other change. Cultures from both kidneys and bladder show gram negative bacilli.

*Microscopic Examination*—Kidney. The cortex is swollen and the convoluted tubules are markedly degenerated. There is a purulent exudate in the glomeruli and in the tubules. The tubules are filled with pus extending down into the medulla and in 3 or 4 areas are filled with pus cells, detritus and bacilli. At no place has a larger abscess been formed. Of especial interest is the purulent infiltration that the outer area of the pelvis in this and another section of the kidney show. The mucosa appears everywhere intact but below this layer there is a dense zone of pus cells varying somewhat in width and showing considerable nuclear fragmentation. In the mucosa a number of pus cells, apparently passing through, can be seen. The bladder is negative.

Ureter. The ureteral wall shows no infiltration. The lumen is filled with pus cells and many bacteria.

R 9.—Dec. 23, '16. Intravenous injection of 2 c.c. of 5 c.c. suspension of 2 tubes broth 18-hour growth from F. Chilled.

Dec. 24. Found dead.

R 10.—Dec. 23, '16. Urine normal. Intravenous injection of 2 c.c. of 5 c.c. suspension of 3 tubes 18-hour growth from S. Chilled.

Dec. 26. Animal is very weak—dying. Sacrificed.

*Autopsy*—Rabbit is considerably emaciated. On opening the peritoneum an enlarged gall bladder is seen glued down to the stomach surrounding the liver by a brownish opaque fibrinous exudate. The colon near the ileo-cecal valve is infiltrated and hemorrhagic. The kidneys are large, of a brownish-yellow color, and on section are very moist. The pelvis contains no excess of fluid and no pus. On tips of the papillae a few opaque yellowish streaks and dots are seen. The bladder is negative. The urine shows no pus cells. Blood culture is negative. Urine culture is also negative.

*Microscopic Examination*—Kidney. The cortex shows nothing abnormal. The medulla shows several areas in which the tubules are markedly distended and filled with granular material. The pelvis is empty and the lining shows no infiltration.

R 18.—Dec. 23, '16. Intravenous injection of 5 c.c. suspension of 3 tubes of 18-hour growth from S. (B coli). Chilled. Died a few minutes after chilling.

R 20.—Dec. 29. Intravenous injection of 24-hour broth growth from right kidney of rabbit 8. Found dead 4½ hours after injection.

R 21.—Dec. 29. Urine normal. Intravenous injection of 24-hour broth growth in 2 c.c. salt solution suspension from right kidney of rabbit 1. Four and one-half hours after injection thoroughly wetted and fanned for ½ hour in a cold room.

Dec. 30. Apparently dying. Died 26 hours after injection.

*Autopsy*—On opening the peritoneal cavity the bladder is enormously distended, injected and with small hemorrhages on surface. Also there is considerable edema, especially at the base of the appendix. Along the entire intestinal canal numerous small hemorrhages are seen subperitoneally. There is a large gland at the base of the appendix, enlarged and hemorrhagic. The appendix, when cut open, has a thickened yellow opaque wall with hemorrhages and a muco-hemorrhagic exudate in the interior. Small hemorrhages are seen on the surface of both kidneys which are greatly enlarged and soft. On section the cortex is thickened, yellow and small hemorrhagic areas are seen. The medulla near the cortex is a deep burgundy red color, apparently hemorrhagic, and this area runs down in a small streak to the papilla. The medulla below this streak is hyperemic, shows no yellow lines and does not appear otherwise abnormal. The pelvis shows nothing abnormal. The bladder appears normal.

The stomach has a small area near the pylorus which looks like superficial erosion, but is otherwise negative.

Culture of the left kidney shows pure culture of *B. coli*.

*Microscopic Examination*—Kidney. The cortex shows marked degeneration in the convoluted tubules and a slight excess of cells in the glomeruli. There is marked hyperemia of the cortex as well as of the medulla. In the medulla there are numerous areas in which there are hemorrhages. The pelvis of the kidney is empty. The mucous membrane shows no infiltration.

Cecum. Extensive hemorrhages through the entire musculature and to less extent into the mucosa are to be seen.

The bladder is normal.

Appendix. There are submucous hemorrhages. Marked inflammatory reaction and subserous masses of bacteria are to be seen, as well as blood pigmentation in the lymph centers.



R 22.—Dec. 29. Urine normal. Intravenous injection of 24-hour broth growth in 2 c.c. salt solution suspension from left kidney of rabbit 8.

One and one-half hours after injection thoroughly wet and fanned for  $\frac{1}{2}$  hour in a cold room.

Dec. 30. 40-50 pus cells in urine.

Dec. 31. 10 pus cells and 100 epithelial cells in urine.

Jan. 3, '17. Sacrificed.

*Autopsy*—The peritoneal cavity is clear and the appendix normal. There are a few small hemorrhages subserous in the cecum.

The gall bladder is normal. The stomach is negative and also the heart and lungs.

The kidneys are a yellowish brown color and uniform. The cortex is translucent and normal. The medulla is also normal. The pelvis is negative. The right ureter about 2 inches below the pelvis is definitely injected for about  $\frac{1}{2}$  inch. The bladder appears normal. Culture is negative.

*Microscopic Examination*—The kidney shows marked degeneration of the epithelium and in some areas just a narrow edge of epithelium remains.

The pelvis and the medulla are negative. The uterus shows acute inflammation of the mucous membrane and a leukocytic exudate in the crypts.

R 23.—Dec. 29. Urine normal. Intravenous injection of 24-hour growth broth in 2 c.c. salt solution suspension from left kidney of rabbit 8.

Four and one-half hours after injection, animal is thoroughly wet and fanned for  $\frac{1}{2}$  hour.

Dec. 30. 25-30 pus cells in urine.

Died about 4 P.M.

*Autopsy*—About 12 inches of jejunum is acutely inflamed. The bladder, appendix and stomach are negative. No culture taken.

Kidney is enlarged, the cortex swollen, yellow, in areas somewhat more opaque. The medulla is hemorrhagic in several areas, extending from the cortex to about half way to the papilla. Several such areas in the right kidney and one small one in the left.

*Microscopic Examination*—The kidney cortex shows marked

vacuolar degeneration of the epithelium, in some areas only a necrotic mass remaining in the center of the tubules.

The glomeruli are very hyperemic but show no excess of pus cells.

In a zone in the medulla there is very marked hyperemia and some extravasation of the blood into the tissues. In several tubules there is necrosis of the epithelium, with leukocytic infiltration and large masses of bacteria. This leukocytic infiltration extends for a considerable distance beyond the areas in which the bacteria are found.

The bladder shows nothing abnormal.

R 24—Dec. 31, '16. Expressed urine shows no pus cells.

2 P.M. Intravenous injection of 2 c.c. suspension of 24-hour plain broth growth from left kidney of R 21.

Thoroughly wet and fanned from 6 to 7 P.M.

Jan. 4, '17. No pus cells in urine.

Jan. 6. No pus cells in urine.

Jan. 12. No pus cells in urine.

Jan. 17. No pus cells in urine.

Jan. 18. Sacrificed.

*Autopsy*—In the cardiac end of the stomach there is a small depression measuring 2 or 3 mm. across, surrounded by a zone considerably thickened and raised above the general surface. The autopsy is otherwise negative. Culture of the bladder urine is negative.

*Microscopic Examination*—The kidney cortex is somewhat hyperemic but otherwise normal. The medulla is normal and the pelvis is empty. The epithelial lining shows no infiltration.

R 25—Dec. 31, '16. Expressed urine: 1st few gtts. 40-50 pus cells and several clusters. Next specimen expressed shows only 6-7 pus cells.

2 P.M. Intravenous injection of 2 c.c. suspension of 24-hour plain broth growth from left kidney of R 21.

Thoroughly wet and fanned from 6 to 7 P.M.

Jan. 1, '17. Expressed specimen contains 15 pus cells and many casts.

Jan. 4. Urine shows an occasional pus cell and much debris.

Jan. 6. Urine shows an occasional pus cell.

Jan. 12. No pus cells.

Jan. 17. No pus cells.

Jan. 18. Sacrificed.

*Autopsy*—On the posterior surface of the right kidney there is a marked depression densely adherent to the capsule. On section the cortex at this point is almost completely gone and is made up of a dense connective tissue. The autopsy is otherwise negative. Culture of the urine is negative.

*Microscopic Examination*—The kidney shows marked degeneration of the epithelia and occasional areas of necrosis. The glomeruli show nothing abnormal. There are no areas of infiltration anywhere.

R 26—Dec. 31, '16. Expressed specimen of urine shows no pus cells.

2 P.M. Intravenous injection of 2 c.c. suspension of 24-hour plain broth growth from right kidney R 8.

Thoroughly wet and fanned from 7 to 8 P.M.

Jan. 1, '17. Expressed specimen of urine shows 25-30 pus cells and numerous large gram casts.

Jan. 2. Expressed specimen of urine shows 2-3 pus cells.

Jan. 4. An occasional pus cell in urine.

Jan. 6. Large excess of pus cells in urine.

Jan. 8. No excess of pus cells in urine but an occasional cast.

Jan. 12. No excess of pus cells in urine.

Jan. 18. No pus cells in urine. Sacrificed.

*Autopsy*—The right lower lobe of the lung is completely consolidated and covered with a purulent exudate. On section this is made up of a number of thickened abscess cavities. The lung just above is a yellowish gray color and consolidated. The kidney shows nothing abnormal externally or on section. Otherwise the autopsy is entirely negative. The culture of the bladder urine is negative.

*Microscopic Examination*—Kidney. The cortex is practically normal. The medulla shows numerous areas of infiltration with lymphocytes involving in some areas 2 or 3 and in others as many as 6 or 8 tubules. In the center of these areas there seems to be a slight proliferation of the epithelial cells. The pelvis shows nothing abnormal, except where these areas come in contact with the surface, where there is a lymphocytic infiltration of the

mucous membrane. The lung shows extensive cavities. Search for tuberculosis bacilli in the abscess wall is negative.

R 27—Dec. 31. Expressed specimen of urine shows no pus cells.

2 P.M. Intravenous injection of 4 c.c. suspension of 24-hour plain broth growth from right kidney R 8.

Thoroughly wet and fanned from 7 to 8 P.M.

Jan. 1, '17. Found dead.

*Autopsy*—Both kidneys showed hemorrhages in the medulla. The bladder is distended with urine but otherwise negative. The cortex is markedly thickened, yellow and opaque. The medulla is markedly injected. The pelvis shows nothing abnormal.

*Microscopic Examination*—The kidney cortex, medulla and pelvis show nothing abnormal.

R 28.—Dec. 31. Expressed specimen shows no pus cells.

2 P.M. Intravenous injection of 6 c.c. suspension of 24-hour growth plain broth from kidney R 8.

Thoroughly wet and fanned from 7 to 8 P.M.

Jan. 1, '17. Animal is very sick—diarrhea. Much pus in stool. In expressed urine there are 5 pus cells.

Jan. 5. Animal died.

*Autopsy*—Jan. 5. Rabbit in rigor mortis. Body is not yet entirely cold. On opening the peritoneum the surface is everywhere smooth. The appendix, cecum, gall bladder, bladder are all normal. The kidneys are a brownish red color but show nothing unusual externally. On section the cortex is somewhat thickened. The medulla and cortex are otherwise negative. The pelvis is somewhat more opaque than usual but shows nothing abnormal. The ureters are negative. The right lung is covered with a fibro-purulent exudate. The middle lobe is consolidated, its edge of a red color. On section the red, wedge-shaped area is entirely solid and of a dark red color. Remainder of the lobe is air containing except for a few hemorrhagic spots.

The pericardium also contains a small amount of fibro-purulent exudate.

The heart is negative on opening. The left lung is normal.

The urine from the bladder contains many hyalin casts but no pus cells.



*Microscopic Examination*—The cortex shows marked degeneration of the epithelium and in some areas complete necrosis. There is no increase of cells in the glomeruli. Along the collecting tubules, extending down into the medulla, there is diffuse infiltration with polymorphonuclear cells, which at no place has led to abscess formation, but in some places to small collections of polymorphonuclear leukocytes. The pelvis shows nothing abnormal. The lung shows a hemorrhagic infarct with extensive bronchitis.

R 17.1.—Jan. 25. Expressed specimen of urine is negative. 2:30 P.M. Intravenous injection of 20-hour plain broth culture of streptococcus from L.

6:30 P.M. Thoroughly wetted and fanned until 7:30 P.M.

Jan. 26. Urine examined: Negative.

Jan. 27. Urine examined: 1 or 2 groups of cells and an occasional cast.

Jan. 29. Urine examined: Negative.

Jan. 30. Urine examined: Large excess of pus cells. Temperature 40.15°.

Smear of urine: A few gram positive diplococci.

Jan. 31. Urine examined: Excess of pus cells, largely in groups. Temperature 39.6°.

Feb. 1. Urine examined: Excess of pus cells. Smear shows a large number of gram positive diplococci. Temperature 39.5°. No albumin.

Feb. 2. Urine examined: Large excess of pus cells and groups of cells. Urine cloudy acid.

Feb. 5. Innumerable pus cells in low power field. Stained smear shows countless gram positive cocci in pairs and chains. Albumin —, acid.

Feb. 6. Urine examined: Countless pus cells, flakes of pus. Sacrificed.

*Autopsy*—Animal is in good physical condition. On opening the peritoneal cavity there is no evidence of coccidiosis. The peritoneum is everywhere smooth. The bladder is slightly distended. The ureters and kidney appear normal externally. There are hemorrhages into the extensor muscle on both thighs. The heart shows nothing unusual. The lungs are negative. The gall bladder, stomach and intestinal canal show nothing abnormal. The *left kidney* is of a reddish brown color, smooth and no

hemorrhages are to be seen externally. The ureter appears practically normal. On pressure pus can be expressed from the cut end. On opening the kidney, a thin liquid pus exudes from the cut section. On section the kidney epithelium seems rather yellowish and opaque and the medulla is light pink in color. The pelvis is distended with thin pus. There is no evidence anywhere of abscess in the kidney substance. The pelvis is not injected.

*Right Kidney*—The ureter is normal and no pus can be expressed, only epithelial debris. The kidney surface is everywhere smooth. On section the cortex is a grayish, somewhat opaque color. The pelvis contains no pus. The kidney appears normal otherwise. Bladder shows nothing abnormal.

Cultures from the bladder urine give a streptococcus. Heart blood culture is negative.

*Microscopic Examination*—Left kidney. There is considerable cloudy swelling of the convoluted tubules and an occasional space is filled with serum. The glomeruli contain no excess of cells. The medulla shows nothing abnormal. The pelvis of the kidney shows only a very small amount of free exudate in the lumen but very marked infiltration with polymorphonuclear leukocytes in the lining membrane. In some portions the eosinophile leukocytes are crowded together in dense masses, frequently lying as a solid layer, directly below the mucosa. The right kidney shows parenchymatous degeneration of the convoluted tubules but is otherwise negative. The left ureter shows nothing abnormal. The bladder is negative.

R 17.2.—Jan. 25. Expressed specimen of urine is negative.

2:20 P.M. Intravenous injection of 20-hour plain broth culture of streptococcus from L.

6:30 P.M. Thoroughly wetted and fanned until 7:30 P.M.

Jan. 26. Urine examined: No pus cells but 10-12 granular casts in low power field.

Jan. 27. Urine examined: 8-10 pus cells per low power field; no casts.

Jan. 29. Urine examined: 20-25 pus cells per low power field; an occasional cast.

Jan. 30. Urine examined: Large excess of pus cells. Temperature 39.6°.

Smear of urine shows no bacteria.

Jan. 31. Urine examined: Large excess of pus cells. Temperature 39.5°.

Feb. 1. Urine examined: Excess of pus cells. A few flakes of pus. Smear shows no bacteria. Temperature 39.0°; no albumin.

Feb. 2. Urine is very clear. One or two pus cells seen in low power field; acid.

Feb. 5. Urine is cloudy and shows an excess of pus cells: one large group and relatively few single cells. Stained smear shows 5-6 gram positive diplococci—only bacteria present.

Feb. 6. Urine shows a large excess of pus cells and many streptococci.

Feb. 7. Urine loaded with pus cells and streptococci. (Expressed specimen.) Sacrificed.

*Autopsy*—On opening the peritoneal cavity the abdominal organs appear entirely negative. The bladder is slightly distended with urine which contains few pus cells and a large number of casts. There is a large amount of pus in the vagina. Smears from the bladder contain many streptococci. On section of the ureter pus can be expressed. There is no pus in the pelvis of the kidneys. Culture of the heart's blood and bladder both show gram positive streptococci.

*Microscopic Examination*—Kidney. The cortex and the medulla show nothing unusual. The pelvis is free from exudate except an area where there are masses of pus cells, detritus and blood corpuscles. The mucous membrane lining the wall is infiltrated with polymorphonuclear leukocytes—in some areas very dense and in others only an occasional leukocyte can be seen lying between the epithelial cells. The ureter shows nothing. The bladder shows a normal intact mucous membrane.

R 174.—Jan. 25. Expressed specimen of urine is negative. 2:30 P.M. Intravenous injection of 20-hour plain broth culture of streptococcus from L.

7:30 P.M. Thoroughly wetted and fanned until 8:30 P.M.

Jan. 26. Expressed specimen of urine: In low power field shows 5-6 pus cells and 1-3 granular casts.

Jan. 27. Urine in low power field shows 5-6 pus cells and 1-3 granular casts.

Jan. 29. Urine examination: Negative.

Jan. 30. Urine examination: Temperature 39.7°.

Jan. 31. Urine examination: Negative. Temperature 39.5°.

Feb. 1. Urine examination: Negative. Temperature 39.9°.

No albumin.

Feb. 2. Urine examination: Negative. Urine cloudy but debris clears up with dilute acetic acid. Urine is faintly acid.

Feb. 5. Urine shows a slight excess of pus cells. Much debris is in expressed urine, brown, probably fecal. Stained smear shows no bacteria. Acid.

Feb. 6. Urine shows a few pus cells but is otherwise negative and there are no bacteria.

Feb. 7. 4-5 pus cells are seen in low power field.

Feb. 8. Urine is negative.

Feb. 9. 4-5 pus cells are seen in low power field; otherwise negative.

Feb. 10. Urine is negative, except for large masses of amorphous precipitate. Acid clears with acetic.

Feb. 12. Urine shows about 30 pus cells in low power field. No bacteria in stained smear. A few casts.

Feb. 13. No excess of pus cells in urine.

Feb. 14. No pus cells in urine.

Feb. 15. About 30 pus cells in low power field. No casts.

Feb. 24. No pus cells or casts in urine.

Feb. 27. Urine negative.

April 2. Died.

*Autopsy*—The bladder is greatly distended with urine which contains 10-12 casts, albumin but otherwise negative. The kidneys are soft and red. The right kidney is negative and the pelvis is smooth. The left kidney has one small abscess extending from the cortex almost to the medulla—about .5 mm. in diameter. The pelvis is everywhere smooth. The stomach, appendix and intestines are negative. Heart shows a pericarditis with fibrinous exudate but is otherwise negative. The lungs appear hemorrhagic in areas and consolidated in parts. The liver shows slight coccidiosis but the gall bladder appears normal. Cultures from the bladder, heart blood and abscess of the left kidney are all sterile.

*Microscopic Examination*—The kidney shows marked degeneration of the convoluted tubules. The glomeruli show an excess of eosinophile cells. In some areas there are small collections



of eosinophile cells outside of the glomeruli. The cortex is otherwise normal. The medulla is rather hyperemic, especially at the tip of the papillae and shows no areas of infiltration. The pelvis is empty. The epithelium shows no signs of infiltration.

R 17.8.

Feb. 8. Urine examined: Negative, acid, albumin —.

4:30 P.M. Injected same as R 17.10, streptococci from L.

Wetted and chilled for 1 hour before fan  $5\frac{1}{2}$  hours after injection. Animal ill after the chill.

Feb. 9 A.M. Animal is better. Urine examined: Large number of epithelial cells and some epithelial casts. No pus cells.

Feb. 10. Urine shows a large excess of pus cells—about 50-60 to low power field. Also an excess of casts.

Feb. 12. Urine contains shreds of pus and large excess of single cells and many casts. Smear shows gram positive streptococci. Animal is weak on hind legs.

Feb. 13. Large number of pus cells in urine. Casts+. Sacrificed.

*Autopsy*—Localized peritonitis around the gall bladder involving under surface of the liver and stomach is seen. Submucosal hemorrhages are scattered over the stomach. The appendix is full of fecal material but is otherwise negative. The bladder shows several hemorrhages. The vagina and urethra are negative. Material expressed from the ureters contains casts and epithelial cells but few pus cells. The kidneys are entirely negative.

The bladder urine contains casts and some pus cells but not a large number. Culture of bladder urine in dextrose broth shows mixed streptococcus and gram negative bacilli.

*Microscopic Examination*—The bladder mucous membrane is intact and there is no infiltration. The appendix shows some necrosis of the lymph follicle. The gall bladder shows some abscesses in the wall.

The kidney, except for slight parenchymatous degeneration of the cortex, shows nothing abnormal.

R 17.12.

Feb. 8. Urine examined: Negative, no albumin, acid.

Feb. 8. Injected same as R 17.10 with streptococcus R 17.1 from L.

Wetted and chilled for 1 hour before fan 5½ hours after injection.

Feb. 9. Urine examined: Negative, except for much amorphous debris.

Feb. 10. Urine examined: Negative.

Feb. 12. Urine loaded with pus cells, single and in groups. Smear shows a number of streptococci.

Feb. 13. Urine shows no pus cells.

Feb. 14. Urine shows no pus cells.

Feb. 15. Urine shows no pus cells or casts.

Feb. 16. Urine shows about 30-40 pus cells in low power field. One large group of cells. Smear shows no bacteria.

Feb. 17. 10-12 pus cells in urine in low power field.

Feb. 19. 50-60 pus cells in urine in low power field. Much amorphous debris.

Feb. 20. Large excess of pus cells and groups of cells in urine. Stained smear shows a few gram positive diplococci but no other organism.

Feb. 21. About 50 pus cells in low power field. A few in groups. Smear shows no bacteria.

Feb. 24. Urine loaded with pus cells and one or two casts.

Feb. 26. Urine loaded with pus cells and 20 casts in low power field. Albumin absent. Smear shows no bacteria. Temperature 39.00°.

Feb. 27. Urine shows no pus cells or casts.

April 2. Slight excess of pus cells. Albumin present, acid.

April 7. Large excess of pus cells and groups of cells in urine. Smear shows many streptococci in chains but no other organisms.

April 8. Urine is loaded with pus cells.

April 9. Urine loaded with pus cells, and excess of casts. Smear shows many streptococci but no other organisms.

April 12. Urine loaded with pus cells and several casts. Smear shows many streptococci but no other organisms.

April 14. Loaded with pus cells and casts. Smear shows just streptococci.

April 20. 50-60 pus cells and 10-12 casts.

April 24. Died.

*Autopsy*—The bladder is half full of urine, containing 4-5 pus cells and much debris. The gastro-intestinal tract is negative

except for some white spots on the appendix. *Kidneys.* The pelvis contains no pus. Some dark spots are seen on the kidneys, probably not acute. Otherwise the autopsy is entirely negative. No cultures made.

*Microscopic Examination*—The kidney cortex is slightly congested but otherwise normal. The medulla is also congested but shows no areas of infiltration. The pelvis is empty. There is no infiltration of the mucous membrane. The ureter is empty and shows no infiltration of the wall. The appendix shows massive necrosis in the central portion of the lymphoid follicles. A large number of bacilli can be seen lying in the lymphoid tissue.

R 17.—Dec. 23. Urine normal. Intravenous injection of 2 c.c. of 5 c.c. suspension of 3 tubes of 18-hour growth from L. Chilled.

Dec. 27. Expressed urine shows 30-40 pus cells to low power field. Aborted.

Dec. 28. Expressed urine apparently is pure pus. Temperature 40°.

Animal sacrificed.

*Autopsy*—Well developed female rabbit. On opening the peritoneal cavity, the uterus is enlarged and injected. The bladder is full of urine which contains no pus. The heart, lungs, liver, stomach and appendix are negative. The kidney has small reddish depressions on the surface. On section there is a small red streak in the medulla. The pelvis is negative. The uterus is ulcerated in areas. The vagina is filled with a thick, yellow-green pus. The pus shows no bacteria.

*Microscopic Examination*—*Right Kidney.* The convoluted tubules show considerable swelling and evacular degeneration. The glomeruli are normal. The medulla shows no infiltration or hyperemia. *Left Kidney.* In the cortex the swelling of the convoluted tubules is very marked. In the upper portion of the medulla there are several areas which are densely infiltrated. The outlines of the tubules are obliterated. There are some polymorphonuclear leukocytes but principally cells of the lymphocytic type. Further down in line with these areas there are other zones of infiltration. The pelvis contains an hemorrhagic exudate in the lumen. The mucous membrane shows slight infiltration with lymphocytes.

R 19.—Dec. 23. 2 c.c. intravenous injection of 5 c.c. of a suspension culture of 3 tubes of 18-hour growth from L. (Streptococci.)

Chilled.

Dec. 27. No urine obtained.

Dec. 28. 3-8 pus cells obtained.

Dec. 29. 3-4 pus cells in urine.

Dec. 30. 40-50 pus cells in urine.

Jan. 4, '17. Large excess of pus cells and some groups of cells.

Jan. 5. Slight excess of pus cells.

Jan. 6. About 15-20 pus cells to low power field.

Jan. 8. About 30 pus cells to low power field.

Jan. 17. About 60 pus cells to low power field.

Jan. 18. Sacrificed.

*Autopsy*—The organs are all negative except the stomach just at the pylorus, an area in which there are 3 or 4 small hemorrhages—one about 2 mm. in diameter. The kidneys are smooth on surface, brownish red color. On opening the right kidney, it appears normal. The left kidney is opened longitudinally. There are seen a number of streaks running from the cortex through the medulla about to the tips of the papillae. The autopsy is otherwise negative. Examination of the bladder urine shows about 60 positive pus cells per low power field, single and in groups. Kidney culture of the bladder urine shows gram positive diplococci and short chains.

*Microscopic Examination*—In the cortex and extending down into the medulla there are some areas of infiltration in which the kidney structure has been destroyed; 5 or 6 such areas can be seen in a single section. The pelvis is empty. The mucous membrane shows no infiltration, except where the infiltration of the medulla comes in contact with the surface.

R 17.3.—Control. Jan. 25. Expressed specimen of urine is negative. No injection made.

6:30 P.M. Thoroughly wetted and fanned until 7:30 P.M.

Jan. 26. Urine examined: Negative.

Jan. 27. Urine examined. Negative.

Jan. 29. Urine examined: Negative.

Jan. 30. Urine examined: Negative. Temperature 39.5°.

Jan. 31. Urine examined: Negative. Temperature 39.7°.



Feb. 1. Urine examined: Negative. Temperature 38.8°. No albumin.

Feb. 2. Urine examined: Negative, crystal clear, acid.

Feb. 7. Urine examined: No cells.

Negative entirely. .

R 17.5.—Control. Jan. 25. Expressed specimen of urine is negative. No injection made.

7:30 P.M. Thoroughly wetted and fanned until 8:30 P.M.

Jan. 26. Expressed specimen of urine: No pus cells.

Jan. 27. Expressed specimen of urine: No pus cells.

Jan. 29. Urine examination: Negative.

Jan. 30. Urine examination: Negative. Temperature 39.4°.

Jan. 31. Urine examination: Negative. Temperature 39.5°.

Feb. 1. Urine examination: Negative. Temperature 39.2°; no albumin.

Feb. 2. Urine examination: Negative. Acid cloudy with debris. Clears up with dilute acetic acid.

Feb. 7. Urine examination: Negative; trace of albumin.

R 17.9.—Control. Feb. 8. Urine examined: Negative.

Injected same as R 17.10—streptococci from L.

Feb. 9. Urine examined: About 12 granular casts in low power field and 5-6 pus cells.

Feb. 10. Diarrhea. No specimen obtained.

Feb. 12. Urine negative.

Feb. 14. Urine shows about 20 granular casts in low power field and 5-6 pus cells.

Feb. 15. One or two granular casts.

Feb. 16. Urine examination: Microscopic negative. Smear shows no bacteria.

Feb. 20. Urine examination: About 10 casts, granular and hyalin to low power field. No pus cells.

Feb. 24. Urine shows about 5-10 pus cells, no casts to low power field, acid.

April 2. No urine obtained. (Pus exuding from the vagina.)

April 6. Dying. Sacrificed.

*Autopsy*.—Made immediately. Female rabbit. The bladder urine contains many pus cells, single and in groups, and many casts. The kidneys are negative and also the stomach, appendix,

lungs, heart, etc. Marked coccidiosis of the gall bladder and liver is seen. The bladder is edematous, congested, and shows a slight exudate. Culture of bladder urine gives mixed growth of gram positive diplococci and gram negative bacilli.

*Microscopic Examination*—The bladder shows nothing abnormal. The cortex of the kidney shows considerable dilatation of the collecting tubules with atrophy of the walls. The glomeruli are crowded full of eosinophile cells and there is also an excess of eosinophile cells in the other portions of the cortex.

The medulla is hyperemic and shows numerous areas that are densely infiltrated with polymorphonuclear leukocytes, principally of the eosinophile type. The pelvis is empty and the mucous membrane shows no infiltration.

R 17.10.—Control. Feb. 8. Urine examined: negative, except a trace of albumin, acid. Injected intravenously with 1 c.c. of a suspension of 48-hour culture from bladder of R 17.1. (*Streptococcus* from L.)

Feb. 9. Urine examined: About 10 casts to low power field, but otherwise negative.

Feb. 10. Urine examined: Negative, no casts.

Feb. 12. Urine examined: Negative, no casts.

Feb. 14. Urine examined: One or two casts, but otherwise negative.

Feb. 15. Urine examined: One or two casts.

Feb. 16. Urine examined: Microscopic negative. Smear shows no bacteria.

Feb. 20. Urine examined: About 10-12 pus cells to low power field and 2-3 casts.

Feb. 24. Urine examined: About 10 casts to low power field and 2 or 3 pus cells, acid.

April 2. Large number of granular and hyalin casts, acid, albumin —.

April 6. Died.

*Autopsy*—Male rabbit. The bladder urine contains a large amount of cellular debris, epithelial cells, and casts. The kidney pelves are smooth and nothing abnormal is seen. There is a hemorrhage on a portion of the small intestines. The stomach and duodenum are negative. There is some coccidiosis of the gall bladder and liver. The heart and lungs appear normal and also the appendix. The bladder is negative and the urethra is

congested and hemorrhagic. Culture of the bladder urine is negative.

*Miscoscopic Examination*—Kidney. There are numerous small longitudinal abscesses in the medulla and an excess of eosinophiles in the glomeruli.

The mucosa of the pelvis shows some areas slightly infiltrated with cells. The lumen is empty. In the ileum there are several large hemorrhages into the submucosa.

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EIWEISSMILCH—Vald. Poulsen (Jahrb. für Kinderhk., September, 1915) began his experience with the use of eiweissmilch some three years ago, with the belief that in it we possessed a means of treatment that should be experimented with, but that would never become general in Denmark on account of its expense and the difficulty of its preparation. He believed that it was useless to try it in healthy children because there were so many other foods more easily obtained that would do as well. The cases in which it should be tested were chronic dyspepsias which had not done well on other foods, especially diarrheal cases. The author has now used this milk for two and a half years in the Königin Louise Kinderhospital in Copenhagen. In all, 124 cases were treated with it. They were children under one year, 85; of intoxication, 28; infantile atrophy, 8; of acute gastroenteritis, 7; of chronic dyspepsia, 42. Of the 28 cases of intoxication only 10 were definitely cured. For this affection the author does not think this treatment superior to others. The results in the 7 acute cases of gastroenteritis were good, but no better than with other treatment. Of the 42 cases of chronic dyspepsia, in 22 the results were good, stools became normal soon and gain in weight began; the treatment continued for four weeks. In 6 cases the results were less good. In 9 complicated cases they were not good. The general impression derived from this group is that the treatment should be further tested. From the 85 cases treated in children under one year we see that this treatment is not needed in intoxication; in acute gastroenteritis it should not be used in all cases, only in cases in which rapid improvement does not arise after other treatment. In infantile atrophy results were poor. In chronic dyspepsia it should be tried when other measures fail, beginning with small doses, which are increased if improvement takes place. It is better to use it in conjunction with other foods, and these should be less concentrated than usual.—*The American Journal of Obstetrics.*

## UNRESOLVED PNEUMONIAS

WHAT BECOMES OF THEM?

BY JULIUS H. HESS, M.D.

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In our present use of the term "Unresolved pneumonia" we are grouping 22 cases of lung infections which were grouped as such in the discharge diagnoses. While the subsequent history of these cases and the anatomical findings have shown this diagnosis to be positively in error in some of the cases, we have taken the liberty of retaining the diagnosis, if for no other reason than to emphasize the danger of using this nomenclature to cover a large group of undifferentiated pathologic conditions.

These 22 cases have been under our observation during the last 5 years with the following results:

RECOVERIES—Of the 18 cases which I have been able to follow to date during the periods ranging from 2 months to 4 years, 10 are living. These latter we have divided into 3 groups: Group 1, Group 2, Group 3, according to their present state of health.

Group 1—Cases 2, 8, 10, 15 and 16 (5 cases), which are in good health.

Group 2—Cases 5 and 9 (2 cases), whose health is fair. Case 5 still anemic after 3½ years, and Case 9 still showing some dullness after 5½ months.

Group 3—Cases 13, 17 and 20. The remaining 3 cases are in poor health. Case 13 developed an empyema following his leaving the hospital with slow convalescence. Case 17 is tuberculous and is at Winfield Sanatorium at present, while Case 20, who was discharged 40 days ago, is still running an afternoon temperature and shows some dullness.

Group 4—8 cases, 1, 7, 11, 12, 14, 19, 21 and 22, all died.

Group 5—4 cases cannot be found.

TUBERCULOSIS AS A FACTOR—Group 1—Of the 5 cases with good recoveries, 2 gave positive tuberculin reactions, but thanks to their good home surroundings, have made recoveries.

Group 2—Both gave negative tuberculin reactions, the convalescence was very slow, the exact cause being unknown.



Group 3—Case 13, which developed an empyema one month after discharge, and the second, Case 17, which now has tuberculosis, both gave positive tuberculin reactions.

Group 4—Of 8 cases which died, Cases 1 and 12 lived only 2 and 5 days respectively after entering the hospital. Both of these cases had pneumonia 2 months previously. On neither was an autopsy made, but a study of the Roentgenograms in Case 12 leads us to believe that these cases undoubtedly were tuberculous, notwithstanding the fact that tuberculin reactions were negative. The other 6 cases, 7, 11, 14, 19, 21 and 22, were under observation for from 24 to 108 days. Case 7 died after 38 days in the hospital with a marked consolidation which was permanently present in the right lower lobe and numerous areas of broncho-pneumonia scattered throughout the lung; the tuberculin reactions were always negative, as were 5 thoracic punctures. Case 11 which was in the hospital for 55 days gave a negative tuberculin reaction, but from the maternal history and the Roentgenographic studies together with the clinical findings, we believe this was a case of generalized miliary tuberculosis. Case 14 had pneumonia 5 weeks previously, gave a positive tuberculin test and at autopsy showed pulmonary and peritoneal tuberculosis. Case 19 gave a negative tuberculin reaction and one month after leaving the hospital was operated for empyema. Case 21 had a syphilitic consolidation in both lungs as proved by autopsy and Case 22 with negative tuberculin reaction developed an abscess of the lungs and later of the brain, following aspiration of the watermelon seed. *Three of this group were almost certainly tuberculous.*

EMPYEMA—2 cases developed empyema following their discharge from the hospital. Case 13, 5 weeks later, was operated and recovered, but is still in poor health 4 years later. Case 19 entered the County Hospital 1 month later with an empyema and died there.

INTERSTITIAL PNEUMONIA—This may be tuberculous or non-tuberculous; the latter may result either from repeated attacks of broncho-pneumonia or secondarily in the wake of encapsulated empyema, usually resulting as a complication of lobar pneumonia.

Cases 2, 15 and 17 undoubtedly belonged to the tuberculous type; the first 2 cases, which are in good health and show no

signs other than rather dense hilus shadows, terminating favorably.

Cases 8, 10, 16, 5 and 9 all were less than 4 years of age and all of them had had previous attacks of pneumonia; all gave negative tuberculin reactions and made at least fair recoveries. They belonged to the non-tuberculous group of interstitial pneumonia.

Frequently in the non-tuberculous type, the process in the lungs heals and by repeated Roentgenographic examinations it may be found completely healed; this, however, may take weeks, months or years so that the portions of the lungs which have shown shadows in the Roentgenograms now possess a normal transparency, but at the same time it may be observed that during the presence of the process in the lungs and especially later the bronchial glands are enlarged as in tuberculosis. In tuberculosis, however, the process in the lungs does not usually reach the healed stage in young children. By the observations of the chronic inflammatory pulmonary diseases we come to the conclusion that the pulmonary process is primary and the process in the glands is secondary. We can see that up to the beginning of the disease in the lungs the glands are entirely free and that they enlarge secondarily only and frequently only after the process in the lungs is healed.

SYPHILIS—Case 21—This interesting case notwithstanding the fact that it had been in the hospital on 3 occasions gave no clinical evidence of syphilis, and the correct diagnosis was made at autopsy. A Roentgenogram taken during the second hospital visit,  $2\frac{1}{2}$  years before death, shows a distinct shadow in the right upper lobe and enlarged peribronchial glands. These earlier findings led to the conclusion that the case was one of generalized tuberculosis and the supposition that the negative von Pirquet was due to an overwhelming tuberculous infection.

FOREIGN BODIES—Case 22—The patient undoubtedly aspirated a watermelon seed during the summer of 1916 preceding her primary pneumonia. Repeated Roentgenographic examinations while showing distinctly cavity formation did not show a foreign body and the etiologic factor was not revealed until she expectorated it, 10 months after aspiration. Her general physical condition improved during her hospital stay until the development of the brain abscess from which she died.

CONCLUSIONS—1—Tuberculosis is frequently a complicating, if not primary factor in many of the fatal cases and unquestionably frequently a factor in delayed resolution in recovered cases.

2—Empyema especially of the intralobular type must be excluded in all cases.

3—Empyema and tuberculosis are the 2 complications to be most carefully watched for and treated, the former surgically, the latter symptomatically.

4—The rare etiologic factors, such as syphilis, foreign body, metastatic and primary new growths, while uncommon, must not be overlooked.

5—The diagnosis of non-tuberculous interstitial pneumonia should always be made with great caution and after exclusion of all other conditions causing similar physical findings.

#### GROUP I. PRESENT HEALTH—GOOD (5 CASES)

CASE	DATE OF ENTR.	AGE	PAST HISTORY	VON PIRQUET	DAYS IN HOSP.	PARACENTESIS	CONDITION ON DISCHARGE AND AT PRESENT	LAST EXAM.	HOME SURROUNDINGS	
2	10-28 1914	4	Negative	Positive	53	Not made	19	Improved	9-28-16	Fair
8	5-10 1913	1.5	Pneumonia 4 weeks be- fore	not made	19	Negative		Improved	10-1-16	Fair
10	8-5 1914	4	Pneumonia 4 weeks before	Negative	8	Not made		Very ill for the next 3 weeks fol- lowing dis- charge.	10-1-16	Poor
15	7-17 1916	2	Negative	Positive	23	None	made	Improved	10-2-16	Fair
16	7-8 1916	3.5	Pneumonia 6 weeks before	Negative	47	Repeatedly negative		Improved	10-3-16	

#### GROUP II. PRESENT HEALTH—FAIR (2 CASES)

5	1-18 1910	1.5	Pneumonia 6 months before	Negative	55	None made		Improved temp. for some weeks	10-1-13	
9	5-4 1916	2	Pneumonia 6 weeks before	Negative	100	Repeatedly negative		Improved. Still dullness rt. lower lobe, evening temp. but no cough	10-28-16	Poor

## GROUP III. PRESENT HEALTH—POOR (3 CASES)

CASE	DATE OF ENTR.	AGE	PAST HISTORY	VON PIQUET	DAYS IN HOSP.	PARACENTESIS	TIME AND PLACE OF DEATH	LAST EXAM.	HOME SURROUNDINGS
13	8-4 1912	6	Negative except for frequent attacks of convulsions	Positive very marked	14	Negative	Poor. Less dullness. Operated for empyema. 9-23-12	10-28-16	Good
17	2-4 1916	12	Negative	Positive	20	Negative	Improved. Now at Winfield with TBC.	10-1-16	
20	8-20 1916	1.5	Negative	Negative	28	None made	Evening temperature and some cough	10-25-16	Poor

## GROUP IV. DIED (8 CASES)

CASE	DATE OF ENTR.	AGE	PAST HISTORY	VON PIQUET	DAYS IN HOSP.	PARACENTESIS	TIME AND PLACE OF DEATH	CAUSE OF DEATH	HOME SURROUNDINGS
7	5-5 1915	2	Measles 4 weeks ago	Not made	38	Five times negative	In Hospital	Unresolved pneumonia	
11	6-14 1916	9	Negative. Mother died of TBC 5 months after boy 1-7-17	Negative	55	Negative	9-8-16 1 month after leaving Hospital	Probably miliary tuberculosis	
12	1-26 1911	2	Pneumonia 11-23-10. In Hosp. 18 days.	Negative	5	Repeatedly negative	In Hospital	Probably TBC.	
14	6-17 1913	2½	Pneumonia 5 weeks ago. Family hist. negative.	Positive	43	Repeatedly negative	In Hospital	Pulmonary and peritoneal tuberculosis	
19	1-30 1913	1½	Entered with primary pneumonia.	Negative	108	Repeatedly negative	One month after discharge from M. R. H. following operation on empyema at Co. Co. Hospital	Empyema	
1	11-20 1915	1	Pneumonia 3 months ago. Never recovered.	Not made	2	Negative	In Hospital	Unresolved pneumonia	
21	10-29 1916	3	Perirectal abscess. Present lung involvement started 4 weeks before entrance	Negative	24	Negative	In Hospital 11-23-16	Syphilis of lung. (Practically whole of rt. lung involv.) Cloudy swelling of kidney. Focal necrosis of liver.	
22	4-14 1917	8	Pneumonia 7-20-16 from which never recov. fully; 5-25-17 during a fit of coughing expectorated watermelon seed.	Negative	60	Pus	In Hospital 6-9-17	Abscess of lung. Brain abscess.	



## CONCERNING THE CLASSIFICATION OF FINKELSTEIN\*

BY JESSE R. GERSTLEY, M.D.

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Doubtless we all have been influenced more or less by the classification of Finkelstein. We know its advantages. Because of the simplicity of its conception, it lends itself readily to teaching purposes. Its simple clinical grouping divides Disturbances of Nutrition into classes as sharply differentiated as the infectious diseases. It answers the demands of the primitive clinician who seeks only a clinical picture. Its weakness lies in its failure to provide factors of etiology—the essence of the Czerny idea.

Undoubtedly each one of us varies in his interpretation of this classification according to his own individuality. It is my hope to learn if there is any appreciable difference in our interpretations, if we are satisfied with the classification as it exists, or if we would approve of some modification.

Ludwig F. Meyer once said to me, "What a wonderful combination might result if Finkelstein and Czerny would co-operate in their teachings." Such a combination would be most logical; strange that it has so rarely been attempted. In reviewing the literature in the hope of finding something along these lines I came across a contribution of Schelbe, who offers the following suggestion: *Deutsch. Med. Woch.*, 1914, Vol. XL., p. 1,115.

### DISTURBANCES OF NUTRITION.

#### A—NORMAL CHILDREN:

##### 1—*Ex Alimentatione.*

- a—Simple overfeeding, with resulting disturbed balance, dyspepsia, intoxication and decomposition.
- b—Underfeeding—inanition.
- c—Too long one-sided feeding, as milk injury and starch injury.

##### 2—*Ex Infectione.*

- a—Enteral infection.
- b—Parenteral infection.

\*Read before the Chicago Pediatric Society, January, 1917.

3—*Heat.*

a—Direct effect—Heat stroke.

b—Secondary effects in the digestive tract.

## B—ABNORMAL CHILDREN:

1—*Constitution.*

a—Exudative diathesis.

b—Rickets.

c—Anemia, etc.

2—*Anatomical Defects.*

a—Faulty development of a single organ.

b—Developmental disturbance of the entire body.

To such a combination the same objections can be raised as were to the original classification of Czerny, *i.e.*, it is not clinical and it makes the clinical subservient to the etiological. Our knowledge of the true etiology is in many cases faulty, and again the true etiological factor is frequently not one but a combination of several, as, for example, heat, parenteral infections, food and hunger. We all know how the application of an etiological term "Milk Injury" to a clinical picture led us astray. Only years of patient study taught us that such a condition might be produced by *insufficient food*; by *constitutional demand for more carbohydrate*—in giving Keller's Malt Soup one not only reduces the fat but also gives increased carbohydrate; by *parenteral infections*<sup>1</sup>; and only recently Bahrt and McLean<sup>2</sup> learned by their metabolism work that in only the *fewest of cases* does the clinical picture of milk injury result from exclusive *over-feeding of fat*. All our work then for naught, and all because we were led astray by an etiological term.

In reviewing the literature with the hope of finding some classification which would give a clinical description of the cases, but which also would include some of the known etiological factors, the writer came upon a contribution of Finkelstein (*Zeit. f. Kinderh.*, 1913, Vol. VII., p. 67), written before this effort of Schelbe. The new contribution seems such a great step forward, so clear and logical and so valuable, that the writer wonders how it has escaped the attention of American pediatricians.

1. Oppenheimer and Funkenstein, *Zeit. f. Kinderh.*, 1911, p. 152.2. *Zeit. f. Kinderh.*, 1914, Vol. XI., p. 143.

Finkelstein divides Disturbances of Nutrition into 2 groups:

1. Those in which there is an abnormal composition of the body, depending upon qualitative or quantitative changes in the food; for example, an alimentary anemia. There is no fermentation in the intestine, and, other than a slight under-nutrition, no retrogressive symptoms associated with disturbed gastro-intestinal function. In these cases we have disturbance of growth and nutrition, as shown by the great changes in the baby's weight and the apparent loose organization of water in the body.

This group contains the *clinical picture* "Milk Injury." To get away from this suggestion as to etiology, Finkelstein first offered "Disturbed Balance," trying to imply a disturbed balance between the different food elements and the body, but to use his own words, "This term is colorless"; and he therefore adopts the term "Alimentary Dystrophy," which suggests what he wishes to say; namely, a poor composition of the body following an error in diet.

2. The second group, characterized by gastro-intestinal symptoms, belongs definitely to the Disturbances of Nutrition, because changes are apparent not only in the gastro-intestinal tract, but also in the skin, muscles, and probably all organs of the body. This group though largely a fermentative group, is not unreservedly so because Erich Mueller could produce a typical picture of alimentary intoxication with normal stools by feeding children a concentrated diet rich in salts, and poor in water. Finkelstein, therefore, suggests the term "The Toxicoses," these being, as you know, dyspepsia, intoxication and decomposition. Decomposition correctly belongs to this group rather than to the former, because it rarely follows alimentary factors alone, but almost invariably is associated with infections. The classification is as follows:

#### DYSTROPHIES:

- a—The pure alimentary type. (This would be the conventional Milk Injury caused by high fat feeding.)
- b—The alimentary type with specific lesion, as scurvy.
- c—The post-infectious dystrophy. (This was formerly called Milk Injury, but probably is a demand of the body for more energy, or maybe a specific demand for carbohydrate.)

*d*—Inanition, partial or general.

1—Underfeeding. (Formerly confused with Milk Injury.)

2—One-sided Starch Feeding. (Body suffering from protein insufficiency.)

3—Demand of body for more carbohydrate. (Another type formerly classified as Milk Injury.)

#### TOXICOSES:

*a*—Dyspepsia.

*b*—Intoxication.

*c*—Decomposition.

As regards the etiology of these conditions:

In the Dystrophies, alimentary factors practically alone are concerned.

The majority of the Toxicoses, however, are influenced by the combined effects of heat, food, infection, hygiene and constitution. Therefore, Finkelstein divides them into 2 groups:

*a*—The alimentary type.

*b*—The so-called mixed type.

This classification seems logical. It gives an excellent combination of clinical and etiological factors. It is a guide for further study.

One question arises, however: where shall we group tuberculosis? Undoubtedly tuberculosis produces a picture similar to that of decomposition. Undoubtedly the child's nutrition is so reduced that from the standpoint of nutrition he is in a state of decomposition. Shall we say to our students, "This is tuberculosis", or shall we group tuberculosis as one of the etiological factors in producing decomposition? I believe the answer is to be found in our own conception of tuberculosis. Do we teach our students that the treatment is primarily of the disease, tuberculosis, or only secondarily so, by means of the infant's nutrition? I believe most of us are satisfied that if we can maintain the infant's state of nutrition we have gone a long way toward combating the disease. Do we impress this sufficiently upon our students? Wouldn't we do so more forcibly by teaching the student to note the state of the child's nutrition first and then seek tuberculosis as a cause? I have done this in my own clinics by placing tuberculosis as an etiological factor in decom-



position—by asking not “Is this tuberculosis?”, but by asking, “Is this a case of decomposition, and if so, is it of the alimentary type, the mixed type, or is it due to tuberculosis?” I wonder how many of you agree with me?

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NONPROTEIN NITROGENOUS CONSTITUENTS OF THE BLOOD AND THE PHENOLSULPHONEPHTHALEIN TEST IN CHILDREN—In a series of 50 children free from evidences of renal disease, chemical examination of the blood by J. S. Leopold and A. Bornhard (American Journal Diseases of Children, 1916, Vol. XI., p. 432) gave the following results: The total nonprotein nitrogen varied between 19 and 40 mg. per 100 c.c. of blood, the average being 28 mg.; the ureanitrogen varied between 8 and 21 mg., the average being 12 mg.; the uric acid varied between 0.6 and 3.2 mg., the average being 1.8 mg.; the creatinin varied between 0.5 and 4 mg., the average being 1.5 mg.; and phenolsulphonephthalein varied between 50 and 96 per cent., the average being 70 per cent. A smaller number (16) of cases with renal involvement was examined. Although this series is not large enough for final conclusions, the following hold true for the cases studied: In acute nephritis the nonprotein nitrogen constituents were found within normal limits; the phenolsulphonephthalein excretion was diminished. In chronic nephritis the nonprotein nitrogen constituents were usually increased, while the phenolsulphonephthalein excretion was diminished. In passive congestion the nonprotein constituents were normal while the phenolsulphonephthalein was diminished. In one case of sarcoma of the kidney with normal urinary findings the nonprotein constituents, with the exception of uric acid, were normal. The latter was slightly increased. The phenolsulphonephthalein excretion was diminished. Figures for the nonprotein constituents of the blood as well as for the phenolsulphonephthalein excretion of children free from renal disease are practically identical with the figures obtained from adults, and vary within the normal limits as the adult figures vary. The changes in these figures in children the subjects of renal disease corresponds, in this series of cases, with the changes observed in adults. The importance of the tests for diagnosis and prognosis, amply demonstrated in adults, will, in all probability, hold true for children, although more cases are required definitely to establish this view.—*The American Journal of Obstetrics.*

## EMPYEMA—SIMPLE, INTERRUPTED AND CONTINUOUS ASPIRATION

BY H. M. RICHTER, M.D.

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The mortality of empyema in children is notoriously high. Holt, in a series of 150 cases treated by various methods (in children under 4 years of age), had a mortality of over 50%, his cases in the first year showing a mortality of 73%, and he comments on this mortality as not unusual. Three factors contribute greatly to this mortality: First, the intoxication of suppuration. Second, the loss of proteid material from prolonged suppuration. Third, the collapse of the infant's lungs, the median diaphragm of infants being so frail that the opposite lung loses much of its volume. Of these factors the first can readily be controlled by any form of drainage. It is a common observation that simple aspiration or incision gives temporary relief. Incision and drainage with or without resection of a rib will carry the infant over the period in which it would be likely to die were infection the great factor. After temporary recovery, the child gradually fails and usually dies during the second, third or fourth week. This death is due to infection plus the loss of large quantities of fluid and proteids. The third factor may develop acutely immediately after any drainage operation. It is also an important factor in the cause of death during the period of suppuration.

The accumulation of pus must not be likened to an abscess elsewhere in the soft tissues; it is the tendency to drain this pus accumulation as an axillary abscess might be drained that leads to the high fatality and morbidity accompanying this condition. Bacteriologic examinations show active organisms in abundance during the first days of the effusion. Toward the end of the second week and later the bacterial activity materially diminishes and in neglected cases in which the pus is examined after some weeks it is oftentimes sterile. If, therefore, we simply diminish the absorption during the period of auto-sterilization of the pus a spontaneous recovery will often ensue. If, on the other hand, we insert a drainage tube into the chest, we seriously complicate matters by adding a mixed and more or less virulent infection to one primarily simple. The suggestion to empty the

chest without drainage is, of course, no new thought, yet a cursory examination of hospital wards shows a large number of children who have been operated upon without any previous attempts at less radical work. It is, moreover, to certain fundamental principles involved in determining how much to aspirate, and when to stop aspirating, that I wish particularly to refer. To aspirate, or to advocate aspiration, has been the indirect cause of death in many cases unsuited to aspiration.

The simplest form of treatment is aspiration in a rational manner; suddenly and completely to empty a pleural effusion of any considerable size is essentially wrong. Given a pleura containing a pint of pus not more than half of the amount should be removed,—48 hours later, perhaps, the greater part of what was left should be removed, and so on until the pleura is well emptied in the course of from 3 to 6 aspirations. It is not necessary to remove absolutely all. If the bacterial findings are satisfactory the remaining fluid will clear up, often rather rapidly, though, I believe, with more deformity of the chest if too much is so taken care of than if aspirated.

The removal of a comparatively small amount of pus disturbs mechanical relations but slightly; there is less absorption because tension is diminished; at the same time it is not so greatly reduced that a compensatory serous effusion is induced. The removal of this smaller amount of fluid will usually materially reduce all evidences of absorption. Temperature, pulse and respiration all are favorably influenced, and the repeated aspirations will bring about a certain percentage of recoveries. The pus will be found to contain fewer and less active organisms toward the end of treatment, and another phenomenon will sometimes present itself: The pus in the later aspirations will be distinctly thicker. This signifies just the reverse of more active suppuration; it signifies instead less active infection and the absorption of the serous elements of the pus, leaving the cellular and therefore less absorbable elements behind. This thicker pus is, moreover, distinctly poorer in bacteria.

After a second or third aspiration it is sometimes found that the temperature will suddenly rise and every evidence of increased intoxication will develop. This phenomenon is commonly looked upon either as an evidence that the infection is not within our control or that reinfection has occurred from the repeated punctures; neither assumption is necessarily correct.

Obviously there is an increased activity of the infective process and of absorption, but the mechanism of its production is different from that commonly assumed. The bacteria in pus are distinctly less active than those in the wall of the abscess; in the case of empyema the bacteria in the pus are practically destroyed before those in the pleural wall.



FIG. 1.—Method of using needle and tube for aspiration of the pleura.

The aspiration of too much pus produces, as stated above, a further serous exudate which carries with it bacteria from the deeper tissues that are still actively pathogenic and it is from this source that we light up our pleural infection. In other words, reinfection comes from the deeper tissues and is commonly the result of too vigorous use of the aspirator. The accompanying photograph (Fig. 1) illustrates a simple method of aspirating a chest; it consists of approximately 4 feet of rubber tubing and an exploring needle of moderate bore. It has been described by many others; Bülow used a similar technic for continuous aspiration. I do not know who first published the method. The rubber tubing is filled with sterile water, the needle attached at one end and inserted in the sixth or seventh intercostal space; the other end of the tube is allowed to hang in a receptacle containing water. The weight of the column of water in the tube is more than sufficient to

aspirate the chest. As soon as pus begins to come, the vessel containing the end of the tube should be raised until the column of water in the tube is not more than 2 to 3 feet in height, unless the pus is very thick. The receptacle should either be graduated or of known size so that by no chance will more than the desired amount be removed at each operation. Various modifications of this very simple procedure



have been suggested, but I believe the above fulfills all requirements. The needle should be inserted wherever the physical signs indicate the accumulation of pus in those cases in which the empyema is localized. The suggestion of Spitzzy to place it at a lower level each day hardly seems called for. Fig. 2, show-



FIG. 2.—Showing variation in level of fluid caused by tipping chest. Also serves to bring out the value of Roentgenography in pleural effusions in children.

ing the free flow of the fluid in the chest caused by tipping the little patient to one side, shows how unnecessary it is to do more than find the fluid. This Roentgenogram also well illustrates the value of the X-ray as an aid to physical examination of the chest in children. The fluoroscopic examination and the Roentgenogram should be as much a part of the study of effusions in the chest as they are in the examination of fractures. They'

are of far greater value in studying the variation in the amount of fluid remaining in the chest than is the physical examination.

The needle must not be placed too low lest the diaphragm in rising interfere with its action. The mere insertion of a fairly large bore needle without the tube will permit of the escape of pus, but permits also the entrance of air. It seems to me that the latter factor is undesirable. The injection of formalin or other bactericidal substance also seems to me undesirable.

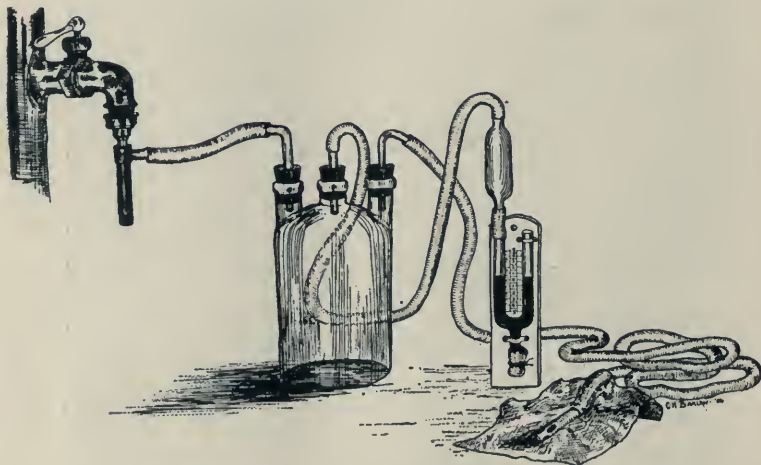


FIG. 3—Apparatus used for continuous aspiration of the pleura in empyema. The rubber dam effects a tight joint between drainage tube and chest wall. The amount of mercury in the tube determines the degree of tension obtained before air passes over and tends to equalize the pressure.

Where infection is not controlled and an increasing degree of intoxication obviously calls for more adequate treatment, drainage of the pleura becomes necessary; but drainage has commonly resulted in a high mortality in young children, partly due to the virulence of the mixed infection which ensues, but quite as much due to the serious loss of proteid that accompanies the loss of so much pus. It is essential in draining the pleura that we obliterate the pleural cavity as quickly as possible by the simple expedient of drawing the lung up to the chest wall. The best means of accomplishing this purpose is one of the modifications of Perthes' method of continuous aspiration. Fig. 3, taken from the author's article published in *Surgery, Gynecology and Obstetrics*, March, 1906 (which see for detail), illustrates a

method used by Dr. Van Hook and myself for upward of 15 years with very satisfactory results. By its means one can maintain a continuous suction or negative tension in the pleural space until complete expansion of the lung occurs. By maintaining the lung fully inflated complete obliteration of the pleural space will quickly ensue. Adhesions between the visceral and parietal pleura will form quite as rapidly as between peritoneal surfaces under similar conditions. In this way the large suppurating pleural cavity can be reduced to but a small granulating surface in a few days and the great flow of fluid from the broad surfaces involved immediately reduced.

This method differs essentially from the Bülow technic and its various modifications. Bülow inserted a good-sized trocar and attached a rubber tube, allowing the weight of the column of fluid to maintain a continuous aspiration, to be continued until suppuration ceased. But living tissues will not permit of continuous pressure of a trocar. Necrosis very quickly develops and the tube becomes loose, and a larger must be inserted to maintain an air-tight joint. With the method here described the joint is made relatively air-tight by using a flap of rubber tissue, with vaselin or similar material between it and the skin. Continuous suction is then maintained with a pump which will take care of any air-leakage that may occur.

Acute suppurative pleurisies of mixed infection and those having their origin in gangrenous or tuberculous cavities are far more serious than the type above described, but they are also much less often found in children. Old neglected cases and cases in older children that have been drained for a long time often offer complications that cannot be met by the simple methods here described.

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TRANSIENT HEMATURIA IN CHILDREN—(Clin. Journ., 1915, Vol. XLIV., p. 396). A. J. Cleveland describes 5 cases, in 3 of which there was no other evidence of disease; the other two were ill during the attack, one recovered, and the other died, but the author does not consider the hematuria had anything to do with the fatal illness. Various diseases which may cause hematuria are considered.—*The British Journal of Diseases of Children*.

## PROPHYLACTIC VACCINATION AGAINST CHICKEN-POX

BY MAY MICHAEL, M.D.

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Sophie Rabinoff's interesting results in prophylactic vaccination against chicken-pox stimulated me to repeat her experiments and opportunity was offered me three times during the winter of 1916, in one of the large institutions of this city.

On January 14th, a case of chicken-pox developed in the admitting ward of the Home for Jewish Friendless and on January 16th, a second case, the children evidently being infected from the same source. The remaining 10 children in this department were vaccinated from these 2, according to the following technic: A scarification  $\frac{1}{8}$  of an inch in diameter was made on the arm of the child to be vaccinated and the contents of a fresh chicken-pox vesicle collected on a small flat spatula and rubbed thoroughly into the scarification. In 5 cases only one insertion was made, in 3 two insertions, and in 2 three insertions. None of the children of this group developed lesions at the site of vaccination and none developed chicken-pox. Three of the children were 4 years of age, one was 5, two 6, one 7, and three 9. A previous history of chicken-pox was given in 4 cases but experience has taught us that parents' statements as to previous illnesses are very unreliable.

On January 27th, a baby in the nursery of the same institution developed chicken-pox and on January 30th a second child—these also were infected from the same source. From these 2, the remaining children in the nursery, 10 in number, were vaccinated. The same technic was used as in the first group but in all except 2, 3 insertions were made. Six of this group developed lesions at the site of vaccination and 2 developed chicken-pox, both children who had vaccinal lesions. The first of these, a 2 year old baby, was vaccinated January 27th, the day of exposure. During the next few days a slight traumatic reaction appeared at the vaccinal site but disappeared by the fourth day. On February 9th, 13 days after vaccination, the upper insertion showed a papule 4-10 of a c.m. in diameter, the middle insertion was negative and the lower insertion was surrounded by an area of redness. The temperature was 100.6°.



The next day a distinct vesicle capped the papule involving the upper insertion, which was surrounded by an area of redness, 1 c.m. in diameter; 4 small maculo-papules and 1 small vesicle were found on the trunk. The temperature was 99.6°. The next day the vaccinal vesicle had increased in size but the area of redness had faded; 2 more small vesicles had appeared on the trunk. On February 12th, the 15th day, 10 small typical chicken-pox lesions were found. In the next few days scabs formed on all lesions and the child was dismissed from the hospital February 25th.

The second case was a 2½ year old baby who was vaccinated January 27th, the day of exposure. February 10th, 14 days after vaccination, a vesicle the size of a pin head developed at the site of the middle insertion. On February 11th the vesicle was 3-10 of a c.m. in diameter and 2 small papules were found on the trunk. The temperature was 100°. During the next 3 days, 10 small chicken-pox vesicles developed on the trunk. These, as well as the lesions at the vaccinal site, rapidly dried and the child was dismissed February 21st.

A marked reaction occurred at the site of vaccination in 4 children besides the 2 who developed chicken-pox. The course of the 4 was so nearly alike that a report of one case is sufficient. E. G., age 4 years, exposed to chicken-pox January 27, 1916, was vaccinated the same day, 2 insertions being made. A slight traumatic reaction occurred on the second and third day but rapidly subsided. On February 8th, 12 days after vaccination, a vesicle appeared at the upper insertion surrounded by an area of redness. February 9th the vesicle had so increased in size that it measured 3.10 c.m. by 4.10 c.m. and the area of redness had reached 1 c.m. A second but smaller lesion capped the second vaccinal insertion. The next day the contents of the vesicles had become purulent but the inflammatory area had subsided. Two small maculo-papules were found on the trunk. The temperature was 99° per rectum. February 11th, the fourth day, there was slight umbilication of the upper vesico-pustule and 9 tiny papules and 1 pin point sized vesicle were found on the body. The next day the papules had faded, none had become vesicles and by the 18th all lesions on the trunk had disappeared and a scab had formed on the vaccination site. The children of this group were all babies between 2 and 3 years, except 1 girl of 10, and none had had chicken-pox previously.

Group 3—On January 31st a 4 year old child in the Hospital of the Home developed chicken-pox. There were 12 children in the Hospital at the time and all were vaccinated. Five developed chicken-pox, 3 on the 13th day, 1 on the 16th day, 1 after leaving the Home. Of these 5, 2 had marked reactions at the site of vaccination and were the only ones who had; 1 with a marked reaction had a severe attack, the other had a mild attack. Three of the children of this group were 2 years old, one 3 years, four 4 years, two 7 years, and two 9 years. Of those who developed chicken-pox 4 were under 5 years of age, and one was 9 years.

*Summary*—32 children in an institution were exposed to chicken-pox and were given prophylactic vaccinations. Seven developed the disease, 6 between 13 and 16 days after vaccination. In the other instance the date was not known. Eight developed lesions at the site of vaccination between the 10th and 14th day, 4 of these developed chicken-pox. Of the 4 who had vaccinal lesions and who developed the disease, 3 had mild attacks and 1 a severe attack; of 3 who did not have vaccinal lesions 2 had severe and 1 a moderately severe attack. The ages of all who developed vaccinal lesions were between 2 and 5 years. This is true also of those who had chicken-pox, except one girl of 7.

It is not fair to draw conclusions from so small a series of cases but certain facts stand out prominently. It is evident that chicken-pox is inoculable, as is shown by the development of lesions at the site of vaccination in 8 of the 32 children vaccinated. This inoculation seems to take place more readily in young children, for the positive results were invariable in children under 5 years of age. The incubation period in cases with a general eruption was shorter than is the usual incubation period of chicken-pox, which is from 16 to 21 days, while in this series it was from 13 to 16 days. In none of the 3 groups was there a second outbreak of the disease. In previous epidemics (and there have been 8 since I have been in charge at the Home), a second group of cases would develop from 16 to 21 days after the first and then a third and often a fourth group, until all susceptible children had had the disease. This time all who contracted the disease had it at the same time. No definite statement can be made regarding the effect of vaccination on the severity of the attack.

A short review of the literature of inoculation of chicken-pox and of prophylactic vaccination against the disease was found interesting, as a number of writers report similar results and in a greater number of cases. Inoculation of chicken-pox was attempted as early as 1816, but all except 2 of these early attempts seem to have been without results. Hessa in 1869 vaccinated 87 children and in 17 obtained a local reaction and in 9 a general eruption. Steiner in 1875 obtained positive results in 8 of 10 cases. D'Heilly in 1885 reports 3 successful inoculations but his results were questioned by a number of confreres who thought that chicken-pox following exposure to the disease could not be excluded. None of these early writers speaks of the protective value of these inoculations.

In 1909 Smallpiece, an English physician, inoculated a child with the lymph taken from a brother who was suffering from the disease. Eight days later he developed a papule at the site of vaccination and on the 12th day a papular eruption, evidently similar to the papular eruption observed in my series. Smallpiece mentions modification of the eruption and shortening of the incubation period by inoculation. Kling had an opportunity to make a rather extensive study of the subject in 1912, when an epidemic of chicken-pox broke out in an orphan asylum in Stockholm. Fifty-eight children were vaccinated. Lymph from clear vesicles was collected on a flat lancet and rubbed into an area of scarification. On the 8th day one or more small red papules appeared at the point of inoculation. The following day they had become vesicles and were surrounded by an area of redness. By the 3d or 4th day the vesicles began to dry and the area of redness to fade. Small brown scabs formed on the lesion. In some instances the lesions never went beyond the papular stage. Six of the 58 children developed papules on the skin and occasionally a vesicle was observed; 31 of the 58 children had lesions at the site of vaccination and only 1 developed chicken-pox. Of 64 non-vaccinated children in the home at the same time 44 developed the disease.

In 1914 E. Handrick repeated Kling's experiment but thought he obtained no advantage from vaccination. Of 127 children vaccinated 45 had chicken-pox. In only 3 cases was there a local eruption. Handrick used a von Pirquet instrument for scarifying and may not have had a denuded surface sufficiently large for absorption of the vaccine. The next

and the last report was by Sophie Rabinoff in the ARCHIVES OF PEDIATRICS, 1915, and was the one which led me to carry out the work here reported. Rabinoff was quite enthusiastic over her results. During an epidemic of chicken-pox in the Hebrew Infant Asylum of New York City, of 142 non-vaccinated children, 114 or 75% developed the disease, while of 76 vaccinated children only 6 or 8% developed chicken-pox and this within the usual period of incubation. Rabinoff is of the opinion that the vaccination undoubtedly limited the spread of the disease and recommends its employment in similar institutions as well as selected cases in the home.

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POST-PNEUMONIC NEPHRITIS—(La med. de los niños, 1916, Vol. XVII., p. 63). L. C. Astor. A boy, aged 2 years, who had had pneumonia 2 weeks previously, presented an edematous face, intermittent edema of the lower limbs, dyspnea, and constant cough. Pulmonary edema in the right lung was found on examination. The urine was albuminous. The issue of the case is not recorded.—*The British Journal of Diseases of Children.*



## OATMEAL GRUEL IN INFANT FEEDING

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### I.

Oats (Rispen Hafer, *Avena Sativa*), has from time immemorial served as a food for human beings. The oats used for animals is that of *Avena Orientalis*. In some countries the peasant classes have, in times of stress, been known to live almost exclusively upon this grain. (Letheby on Food.) Every land has a species peculiar to its soil and climate, but the food value of the grain is much the same everywhere.

Oats contain a high percentage of carbohydrates and fat in greater amount than other grains, such as rice, wheat, etc. (Table I.) The fat in oats besides being higher in percentage is better in quality than that contained in other grains. Töpfer found that the fat of oats has 11.49% lecithin (0.44 phosphorus), the amount differing with the species. (Table II.) The iron content of oats is also very high. (Table III.)

The French innovated the use of oats in infant feeding and its efficacy won for it many advocates. Now oats is being used quite extensively and universally for well and sick children in the form of oatmeal gruel and breakfast foods. In this paper we shall present the results of our work with one preparation made from oats, namely, oatmeal gruel.

We used oatmeal gruel in infant feeding to a great extent at the University Children's Hospital in Vienna. At the suggestion of Prof. von Pirquet, we made a study during 1914 of the different cases that were receiving Haferschleim (*oatmeal gruel*) for the purpose of watching the clinical effects on the infant, and with the view of determining the dry substance of the gruel and its caloric value, if possible. The latter experiments were made at the laboratory of Prof. Frankel.

It was our impression from the beginning that oatmeal gruel, besides being of value in adding calories to the food, would have a favorable effect upon the stool. The latter opinion is also expressed by Jacobi in Gerhard's *Handbuch für Kinderkrankheiten*, 1877, page 405:

\*From the K. K. Universitäts Kinderklinik, Wien., Vorstand Prof. von Pirquet and from Rudolph Spiegler Cancer Laboratory, Vorstand Prof. Sigmund Frankel.

"Children with a tendency toward constipation should be given oatmeal gruel."

With this idea in view we added oatmeal gruel to different mixtures of food. Some infants we fed exclusively on the gruel for a short time (24-36 hours). At first we used different percentages varying from  $\frac{1}{2}\%$  to 5%. We soon discarded all but the 5% preparation as the smaller percentages we found had no effect whatever upon the stool.

Our method of preparation was the following:

To make 1,000 c.c. of the 5% gruel we took 50 grams of the oat grits. After the grits were thoroughly washed in cold water, the water was poured off and 1,500 c.c. of warm water was added. After boiling for 30 minutes in open flame the liquid was strained off and measured. If the amount derived was less than 1,000 c.c. the deficit was made up by the addition of warm water to the amount required.

This method of preparation differs from those described in the text books. Pfaundler and Schlossman, for instance, advise the preparation of a 3% gruel made in the following way:

Fifteen grams of oat grits are washed in 3 different waters. They are then allowed to remain in water for 2 hours until they are quite swelled. The liquid is poured off and about  $\frac{3}{4}$  of a liter of fresh water is added to the mixture, also a grm. of salt. The gruel is then boiled and strained through a sieve. Czerny and Keller advise that the gruel be permitted to boil for  $\frac{3}{4}$  of an hour to 2 hours. In some hospitals they boil the gruel for as long as 6 hours. We have, however, found our method to be more simple and to serve the purpose most adequately.

We are able to report the following clinical observations:

Oatmeal gruel added to milk or eiweiss milk increases the appetite of the infant. Not a single case vomited after taking the oatmeal gruel. Contrary to the opinion of some authorities (Czerny, Keller, Finkelstein, see Table IV.), that the thick gruel *i.e.*, gruel that becomes thick on standing, should not be given to infants the first 3 months, we found that infants of any age bear a 5% preparation well and benefit by the taking. We have, in a number of cases, given thick gruel to infants one month of age with good results. We have tried solutions of 8% and 10%

but they were too thick for children of any age. The solution was too thick to pass through the nipple of the bottle, and besides children refused to take it in this form even from a spoon.

The stool resulting from the administration of the 5% gruel either alone for a period of 24 hours or added to milk has been found to be yellow in color and homogeneous in character, except in severe intestinal disturbances, where the stool had a character peculiar to the disease. If given in sufficient quantity, *i.e.*, on an average of 150 to 200 c.c. a day, either as a diluent for milk, or by itself, it will in a great many cases relieve constipation. While nothing positive can be offered in explanation of the action of the oatmeal gruel in increasing the appetite and in relieving constipation, it seems plausible to ascribe it to the carbohydrate contained in the oats. Children always take a food better when it contains carbohydrates, because of the pleasanter taste. This fact may account for the increase of appetite accompanying the taking of the oatmeal gruel, although it does not explain the fact that in some cases the addition of sugar did not act as well as the addition of the oatmeal gruel. The relief of constipation may be ascribed to the fermentation of the carbohydrates in the intestines.

The cases following may serve to illustrate some of the points mentioned:

#### Case I.

G. K. ....

Premature infant (6 months).

Born March 2, 1914. Admitted May 17, 1914.

Received 12 feedings of mother's milk (pumped).

Weight curve rising. Occasionally constipated.

May 5, 1914.  $6 \times 30$  mother's milk.  $6 \times 30$   $1/3$  cow's milk and 3% Nahrzucker.

Constipation constant, necessitating enemas.

July 1, 1914.  $7 \times 50$   $1/3$  cow's milk with  $2/3$  oatmeal gruel and 4% N. Z.  $4 \times 50$  mother's milk. Stool daily, normal in color and consistency.

July 31, 1914. Oatmeal gruel discontinued.

Given  $4 \times 50$  mother's milk.  $7 \times 50$   $1/2$  cow's milk and 5% Nahrzucker. Constipation set in again.

Case II.

W. S. ....

Nursed by mother. Had no stool without enema.

150 c.c. oatmeal gruel given.

Bowels move every day or every other day.

75 c.c. gruel given. Constipation set in.

Put on 150 c.c. again and constipation relieved.

Case III.

K. B. ....

Born April 19, 1914. Admitted May 4, 1914.

Diagnosis. Atrophy.

Received alkaline eiweiss (Mayerhofer), mother's milk, and 5% Nahrzucker.

Stools dyspeptic, mucous, 3-5 daily.

Weight curve fluctuating.

July 1, 1914. Given half milk and half oatmeal gruel 5%, Nahrzucker 5%.

Weight curve stationary.

Stools 2-3 daily.

First 2 days dyspeptic in character.

Now (August 1, 1914), normal.

Case IV.

A. K. ....

Born April 6, 1914. Admitted May 18, 1914.

Mehlnahrschaden. 17 stools daily.

Vomiting and Thrush.

Received 6 × 80 Finkelstein's Eiweiss Milk.

6% Nahrzucker.

Stools improve.

Weight curve rises.

June 23, 1914. 4 × 100 Finkelstein's Eiweiss and 6% N. Z.

2 × 100 half milk and 4% N. Z.

Stools 4-5 daily. Dyspeptic and mucous.

July 3, 1914. 3 × 100 Finkelstein's Eiweiss.

5% N. Z.

3 × 100 half milk and oatmeal gruel with 5% N. Z.



Stools after 3 days 1-2 daily. Normal in consistency and color.

Kept under observation for entire month. No change. Weight curve rising.

## II.

The second part of our work consisted of the determination of the specific gravity, the dry substance and the caloric value of oatmeal gruel.

200 c.c. of oatmeal gruel was taken and prepared in the following manner:

100 grams oat grits was washed in cold water once, and 300 c.c. warm water was poured over them. The mixture was then boiled 30 minutes and strained—amount remaining exactly 200 c.c. The specific gravity of the gruel, quantity 50 c.c., was taken in temperature of 14° R. (17.5° C.), and was 1005. We put 100 c.c. of the gruel on a water bath until only a small quantity of it was left, then we transferred it to a thermostat under a temperature of 120° C. The dry substance in constant weight was 1.5671 grams.

Thus in 100 c.c. of oatmeal prepared in the manner described above there was 1.5671 grams of oats.

We next prepared the calorimeter (Berthelot-Mahler), poured into it 2,465 c.c. of water, which was permitted to stand at the room temperature for 2 days. 1.2254 gm. of substance was pressed and made into the form of a pastile. This was put into a platinum receptacle which was attached to a platinum rod, and the two poles connected by iron wire. 20 atmospheres of oxygen were infused. Bomb was then put into calorimeter and the wires touched.

The constant temperature was 0.03°. Temp. rose to 1.8555°, making increase of 1.8255.

Process of determination:

$V = T (W + WB) - (St + Z)$  where

V = burning value.

W = weight of water in calorimeter.

WB = water value of bomb.

Z = burning value of iron rod.

St = nitrogen produced.

T = heightened temperature.

1.825 (Temp. increase) times 2,465 (water) equals 4,498.625. Deduct 24 for the nitrogen production after burning and the iron rod which has been tested, and the result is 4,474.625, which is the number of small calories for 1.2254 grms. of substance.

4,474.625 divided by the substance (1.2254) equals 3,651, number of small calories or 3.651, number of large calories for 1 gram of substance.

5% oatmeal gruel contains 1.5671 grams—dry substance. The value is thus 3,651 times 1.5671 which equals 5,476.5 small calories or *5.4 large calories in 100 c.c.*

(The caloric work was checked up by determinations of oatmeal and oat grits.)

#### SUMMARY

- 1—Oats is an important addition to infant food.
- 2—The most valuable preparation is oatmeal gruel.
- 3—The 5% solution is the most efficacious.
- 4—Oatmeal gruel can be prepared very simply by washing grits in cold water and boiling for 30 minutes and then straining.
- 5—Gruel can be given at any age with beneficial results.
- 6—Its taking increases the appetite of the child.
- 7—It makes the stool homogeneous.
- 8—It often relieves constipation.
- 9—It has high iron content.
- 10—The gruel, prepared in the above way, contains 15.671 gm. dry substance in 1,000 grams.
- 11—The caloric value of 1,000 grams is 54. large calories.

TABLE I.

ANALYSIS OF DIFFERENT FOOD VALUES. ACCORDING TO  
MOLESCHOTT.

	Wheat	Rye	Barley	Oats	Corn	Rice	Potatoes
Albuminoids	13.54	10.75	12.26	9.04	7.91	5.07	1.32
Cellulose	3.24	4.96	9.75	11.65	5.25	1.02	6.44
Starch	56.86	55.52	48.26	50.34	63.74	83.30	15.43
Dextrin	4.67	8.45	9.95	4.96	2.35	0.98	1.89
Sugar	4.85	2.88	9.95	6.54	1.85	0.17	
Fat	1.85	2.11	2.63	3.99	4.84	0.75	0.16
Salt	2.00	1.46	2.65	2.59	1.29	0.50	1.02
Water	13.00.	13.87	14.48	10.88	12.01	9.20	72.75

TABLE II.

COMPOSITION OF OATS OF DIFFERENT COUNTRIES

(From König's *Chemie der Menschlichen Nahrungs und Genusmittel*, Vol. I., p. 533.)

<i>In original substance</i>					<i>In dry substance</i>				
No. of H <sub>2</sub> O Anal- sis	%	N. %	Fat %	N. Free Extr.	Raw Fiber	Ashes %	N. Subs.	N. Free Extr.	N. %
I. Middle & North Germany.									
109	12.81	10.17	4.55	58.76	10.43	3.28	11.66	67.01	1.87
II. South & West Ger.									
42	12.81	11.43	5.25	56.12	11.02	3.37	13.17	65.00	2.11
III. Austria-Hungary.									
34	12.81	11.34	5.82	55.88	10.94	3.21	12.98	63.73	2.08
IV. France.									
122	12.81	9.41	5.81	60.08	8.60	3.29	10.79	68.51	1.73
V. America.									
7	12.81	10.87	4.50	59.95	9.12	2.75	12.47	68.76	2.00
Average all Countries.									
347	12.81	10.25	5.27	59.68	9.97	3.02	11.75	68.44	1.88

TABLE III.

LIST OF FOODS WITH THEIR IRON CONTENT

Rice	100	grams	contain	1.8	milligrams	Iron
Rye	100	"	"	4.9	"	"
Wheat	100	"	"	5.3	"	"
Oats	100	"	"	13.1	"	"
Corn	100	"	"	3.6	"	"

TABLE IV.

DOSES OF HAFERSCHLEIM (FINKELSTEIN)

*First Month.*

5 grams grits in 1 Liter H<sub>2</sub>O which equals ½%

*Second Month.*

10-20 " " " " which equals 1-2%

*Third Month.*

15-30 " " " " which equals 1.5-3%

*Second Three Months.*

30-40 " " " " which equals 3-4%

## MISCELLANY

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### FEEDING CHILDREN FROM TWO TO SEVEN YEARS OLD\*

A recent survey of the leaflets of advice on dietetics and food economies disclosed the fact that much was being said about feeding babies and adults, but that little attention was being paid to the very important group in the community, namely, children from two to seven years of age. At the request of the Department of Health a leaflet has been prepared to meet this need. It represents a large amount of careful work by four members of the Health Department's Advisory Council, namely, Drs. L. Emmett Holt, Graham Lusk, Linnaeus E. La Fétra, and Godfrey R. Pisek, and constitutes an authoritative statement. The computation of food prices was made by Dr. F. C. Gephart. The leaflet is designed especially for the use of visiting nurses, social service workers, and others who come into close contact with those who are most in need of instruction in food economies.

We feel certain that our readers will be glad to avail themselves of this information, and we therefore reproduce the leaflet in full. Extra copies of the leaflet will be printed and may be had on application to the Bureau of Public Health Education, Department of Health, 139 Centre Street, New York.

#### FOOD FOR CHILDREN FROM TWO TO SEVEN YEARS OLD

The purpose of this leaflet is to supply for children of these ages a diet which is

1. Sufficient, *i.e.*, a balanced diet furnishing enough for repair and healthy growth.
2. Digestible; excluding articles which are difficult of digestion for young children.
3. Economical at present high prices.

The amount of food needed by a healthy child from two to four years is estimated to be from 1,200 to 1,400 food units

\* From the Weekly Bulletin of the Department of Health, City of New York, July 28, 1917.



(calories). The amount needed by a child from four to seven years is from 1,400 to 1,700 food units (calories).

The food substances which must be supplied in the diet are :

1. Fat.
2. Carbohydrate (sugar or starch).
3. Protein.

Besides these main substances, there are other elements in the diet which must be considered: water, certain salts and substances spoken of as "vitamines." Not only are all of these necessary, but they must be furnished in certain proportions to maintain health. It is possible to fulfil the requirements of a proper diet, meet the condition of present unusual prices and still have a wide choice of foods.

#### FATS

Both animal and vegetable fats are useful as foods. In the following table the fats are arranged according to their food value and their price per pound:

	Cost of 1,000 calories	Price per lb.	
Cottonseed oil .....	7.3 cents	31 cents	
Oleomargarin .....	8.5 "	30 "	
Peanut butter .....	8.8 "	25 "	
Butter .....	11.9 "	43 "	
Olive oil .....	12.1 "	51 "	
Bacon .....	13.8 "	37 "	
Cream (extra heavy, 40%)..	19.8 "	65 "	(pint)
Bacon, sliced, in jars.....	22.2 "	65 "	

Animal fats are superior to vegetable fats as foods. Of the fats, oleomargarin is altogether the most economical; its wider use is to be recommended.

#### CARBOHYDRATES

These include cereals, vegetables, bread stuffs, sugar and sweets.

##### I. CEREALS

These may be purchased in bulk (loose) or in special packages, the latter being always more expensive.

Cereals arranged according to their food value and price per pound:

	Cost of 1,000 calories	Price per lb.
Corn meal, in bulk.....	3.6 cents	6 cents
Hominy, in bulk.....	3.6 "	6 "
Broken rice, in bulk.....	3.7 "	6 "
Oatmeal, in bulk.....	3.8 "	7 "
Samp, in bulk.....	4.2 "	7 "
Quaker oats, in package....	4.4 "	8 "
Macaroni, in package.....	4.5 "	13 "
Wheat flour, in bulk.....	4.6 "	8 "
Malt breakfast food, in package .....	4.8 "	14 "
Pettijohn, in package.....	5.3 "	12 "
Cream of wheat, in package.	5.7 "	10 "
Farina, in package.....	5.9 "	12 "
Cracked wheat, in bulk....	5.9 "	10 "
Pearl barley, in package....	6.0 "	10 "
Barley flour, in bulk.....	6.1 "	10 "
Whole rice, in bulk.....	6.1 "	10 "
Wheatena, in package.....	8.1 "	14 "

To be recommended as the cheapest, if purchased in bulk, are oatmeal, corn meal, hominy, samp and rice.

#### *Dry or Ready-to-serve Cereals*

	Cost of 1,000 calories	Price per lb.
Shredded-wheat biscuit.....	7.8 cents	13 cents
Grape-nuts .....	8.6 "	15 "
Force .....	9.4 "	16 "
Corn flakes .....	11.7 "	20 "
Puffed rice .....	23.5 "	52 "

Their high cost and more difficult digestion by young children more than offset the ease of preparation of these foods.

## II. VEGETABLES

	Cost of 1,000 calories	Price per lb.
Turnips .....	20.0 cents	2.5 cents
Sweet potatoes .....	21.8 "	10.0 "
White potatoes .....	25.8 "	4.0 "

	Cost of 1,000 calories	Price per lb.
New beets .....	27.6 cents	5.0 cents
Onions .....	29.3 "	6.0 "
Spinach .....	30.0 "	3.3 "
Green peas .....	39.2 "	10.0 "
Lima Beans .....	39.2 "	10.0 "
Cauliflower .....	42.9 "	6.0 "
Carrots .....	50.0 "	8.0 "
String beans .....	55.6 "	10.0 "
Squash .....	76.2 "	8.0 "
Lettuce .....	89.4 "	7.0 "
Celery .....	214.0 "	15.0 "

No raw vegetables, such as radishes, tomatoes, cucumbers, onions or celery, should be given; also, no green corn, peppers, egg plant or cabbage. The value of vegetables depends not only upon the amount of fat, carbohydrates and protein they contain, but also upon their richness in iron and other important salts and upon the amount of fiber which aids proper action of the bowels. They are indispensable to a proper diet in spite of their relatively high cost. Of particular value are spinach, beet tops, chard and other "pot greens."

### III. BREAD STUFFS

	Cost of 1,000 calories	Price per lb.
Ginger snaps .....	6.3 cents	12.0 cents
Graham bread .....	8.2 "	10.3 "
White bread .....	8.5 "	10.3 "
Rye bread .....	8.7 "	10.3 "
Graham crackers .....	9.2 "	18.0 "
Soda crackers .....	9.4 "	18.0 "
French rolls .....	10.8 "	14.0 "
Uneda biscuit .....	12.4 "	24.0 "

Bread and rolls should be stale (2 days old) or dried on the stove or in the oven till crisp. Crackers usually cost much more than bread of equal food value. Hot bread or rolls, griddle cakes and doughnuts should not be given. Corn bread should be used for a least one meal a day.

## IV. SUGAR AND SWEETS

Not more than one teaspoonful of sugar should be given on a dish of cereal. No candy or chocolate should be given before a child is 5 years old, and then not more than one piece a day.

## PROTEIN FOODS

Attention is called to the fact that the protein foods as a class cost much more than either the fats or the carbohydrates. One of the greatest difficulties to be overcome in furnishing a proper diet at moderate cost is to supply the proteins in the amount needed. Altogether the cheapest and best protein for children is that found in milk.

	Cost of 1,000 calories	Price per lb.
Milk (Grade A).....	18.5 cents	13 cents (quart)
Roast beef (rib).....	23.4 "	26 "
Buttermilk .....	26.5 "	9 " (quart)
Lamb chops (loin).....	32.7 "	43 "
Lamb chops (rib).....	34.9 "	38 "
Young codfish (fresh)....	38.6 "	12 "
Chicken (roasting) .....	41.3 "	32 "
Eggs .....	44.7 "	45 " (dozen)
Beefsteak (round) .....	45.6 "	34 "
Haddock .....	46.0 "	12 "
Flounder .....	50.0 "	12 "

At certain seasons and in certain places other varieties of fresh fish are cheap and useful. Some vegetables are very high in protein and may largely replace meat in the diet; such are the various kinds of beans and peas, either fresh or dried; they may well be given as soups. If these are furnished, together with milk and bread, meat may be dispensed with altogether. Of the cereals, the preparations of wheat and oats contain most protein.

Sausage, pork, ham, liver, smoked, salt or dried fish are not to be given to young children.

## FRUITS

	Cost of 1,000 calories	Price per lb.
Fresh (in season)		
Grapes .....	14.9 cents	5 cents
Rhubarb .....	15.4 "	1 "



	Cost of 1,000 calories	Price per lb.
Bananas .....	20.0 cents	6 cents
Apples .....	23.7 "	5 "
Pears .....	46.0 "	12 "
Oranges .....	58.8 "	10 "
Peaches .....	96.7 "	15 "
Dried		
Prunes .....	8.4 "	10 "
Apples .....	11.1 "	15 "
Peaches .....	12.5 "	15 "
Apricots .....	15.5 "	20 "

Many fresh fruits are too expensive for general use except for short periods when they are in season and abundant; at such times they should be used freely. Berries, cherries, pineapple and plums should not be given, since they are not easily digested and are usually expensive. Stale fruit, unripe fruit or fruit out of season should not be given to young children.

Bananas should not be given raw unless thoroughly ripe; all others are difficult of digestion unless cooked (baked or boiled).

The more extensive use of *stewed dried fruits* should be urged. They are to be preferred to much of the fresh fruit that is sold. Fruit should be given with the other food, not between meals.

#### DESSERTS

Those *permitted* young children are, plain puddings, made from rice, farina, cornstarch or stale bread; custard, junket; ice-cream not oftener than twice a week and in small portions; bread with (corn) syrup or jelly; plain cookies, ginger snaps, sponge cakes or lady fingers may be given once daily with meals.

*Forbidden* are, pies, pastry, rich cakes, particularly those made with nuts and dried fruit.

#### DRINKS

Milk, not less than a pint nor more than one quart for each child daily. For the younger children *milk is indispensable* and even at its present high price is cheaper than any other food of equal value. Cocoa, made with milk, may be substituted for milk in cold weather. Water should be given freely between meals; a child of 5 should drink from 2 to 4 glasses daily.

Tea, coffee, wine, beer, cider and soda water should not be given to young children.

#### HABITS TO BE AVOIDED

Food should not be given at other than regular meal times.

A child should not be allowed to make his entire meal from any article of food, such as milk, potato, meat, etc.

A child must be taught to chew his food; much drinking with meals encourages rapid eating, and should not be permitted.

When a child has lost his appetite, coaxing or forcing food should be avoided; also, all feeding between regular meals.

#### COOKING

Most *cereals* should be cooked for three hours and none less than one hour. They may be cooked in a double boiler or in a fireless cooker, which is the simplest and much the most economical if gas must be used.

All *vegetables* should be thoroughly cooked, the green ones with very little water. They should then be finely mashed, or, better, rubbed through a coarse sieve. Potatoes should be boiled with skins on and peeled afterwards; by ordinary peeling before cooking, at least one-sixth of the potato is wasted.

*Meats* should be roasted, broiled or boiled; neither meat, chicken nor fish should be fried; roast or broiled meat should be given rare.

*Eggs* should be soft boiled, coddled, poached or scrambled.

*Meat stews*, such as are made from neck of mutton with potatoes and other vegetables, are to be recommended, provided they are thoroughly cooked and the fat has been removed.

Clear *soups* have almost no food value, but meat soups to which vegetables and barley, rice or noodles are added are useful food. Thick soups, especially those made from peas and beans, with the addition of milk, are very nutritious and cheap, and can largely replace meat and eggs in the diet.

A child's appetite is not always a reliable guide as to the amount of food he needs. In the following sample diets are furnished sufficient quantities of food for healthy growth. Meat has been omitted from these lists not because it is undesirable at this age, but because of its high cost.

SAMPLE DIET—TWO TO FOUR YEARS

- Breakfast, 7 A.M.* Cereal (oatmeal, hominy, rice or corn meal), 2 to 3 good tablespoonfuls with 1 even teaspoonful sugar and 2 ounces milk.  
Crisp toast or bread (stale), 1 or 2 slices with butter.  
Milk, 8 ounces, from cup.
- Morning lunch, 10.30 A.M.* Milk, 6 ounces.  
Bread (stale), 1 slice.
- Dinner, 1.30 P.M.* One egg, or cup thick soup.  
Rice or macaroni, 2 tablespoonfuls, or 1 small baked potato.  
Fresh vegetable, 2 tablespoonfuls.  
Stewed fruit, 3 or 4 tablespoonfuls.  
Bread, 1 or 2 slices, with butter.  
Water.
- Supper, 6 P.M.* Cereal, 2 or 3 good tablespoonfuls with sugar and 2 ounces milk.  
Milk, 6 ounces, from cup.  
Bread and butter, 1 slice.  
Custard, junket or plain pudding, 2 to 4 tablespoonfuls.

SAMPLE DIET—FIVE TO SEVEN YEARS

- Breakfast, 7.30 A.M.* Cereal (as given for two to four years). 4 tablespoonfuls with 1 teaspoonful sugar and 2 ounces milk.  
Bread (stale), (white, graham or corn bread), or toast, with butter, 2 slices.  
Fruit, 1 fully ripe banana, peach, pear, or grapes, in season.  
Cocoa made with milk, 1 cup; or milk, 8 ounces.
- Dinner, 12.30 P.M.* Meat stew with vegetables; or soup made with milk and peas or beans; or fish; or egg.  
Potato, rice, samp or macaroni with oil or butter.

*Dinner, 12.30 P.M.**(Continued)*

Fresh vegetable (spinach, chard, squash, carrots, turnips, string beans, boiled onions or celery), 3 tablespoonfuls.

Bread and butter, 1 or 2 slices.

Stewed dried fruit (apples, peaches, prunes, apricots), 3 or 4 tablespoonfuls.

Ginger snaps or plain cake or jelly sandwich.

*Supper, 6 P.M.*

Cereal as at breakfast, with soup, or one egg.

Bread (stale), 2 slices, with butter or peanut butter.

Cup of cocoa made with milk.

Plain pudding made with milk; or stale bread with corn syrup.

BACTERIOLOGY OF THE URINE IN CHILDREN—In 118 specimens of carefully catheterized urine from 61 different girls, examined by C. Beeler and H. F. Helmholtz (*American Journal Diseases of Children*, 1916, Vol. XII., p. 345) 61 were sterile and 57 contained bacteria. Of those from normal infants, 13 were sterile and 11 contained bacteria. Of those from extra-urinary infections in patients under 2 years of age, none were sterile and 24 contained organisms. In those from girls over 2 years, 38 were sterile and 22 contained bacteria. The number of bacteria found in Series 1 was larger than in Series 2. The bacterial flora was practically the same in both series, grampositive cocci and diphtheroid organism predominating, the former being present in practically every case. In no instance were gram-negative bacilli found in such numbers in both specimens that it seemed probable that it was more than an accidental contamination from the urethra. The writers conclude that organisms of the colon bacillus group are not normal inhabitants of the female urethra. In extra-urinary infections occurring in the first 2 years of life the colon group of bacilli are frequently found in the urethra ( $\frac{1}{3}$  of the cases). In girls over 2 years of age the urine is almost free of organisms, and in their series was entirely free from bacilli of the colon group (18 normal, 12 other infections).



# ARCHIVES OF PEDIATRICS

OCTOBER, 1917

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PUBLISHED MONTHLY BY E. B. TREAT & CO., 241-243 WEST 23D STREET, NEW YORK

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## ORIGINAL COMMUNICATIONS

### THE CLINICAL MANIFESTATIONS OF POLIOMYELITIS

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Chicago, Ill.

In view of the serious reports from New York City concerning an epidemic of poliomyelitis in the summer of 1916, the Health Commissioner of Chicago, realizing the possibility of the advent of a wide-spread epidemic of this disease in that city, immediately organized the Department of Health for the purpose, if possible, of prevention, and for control of cases as they appeared, and appointed a commission consisting of the following members: Dr. Maximilian Herzog, Dr. Carl Meyer, Dr. Henry B. Thomas, Dr. A. L. Hoyne and Dr. Edward K. Armstrong, requesting that they make a study of the disease from the clinical, etiologic and pathologic standpoints.

The observations recorded here are the results of the clinical examination of 240 cases with a special study of 100 cases, the symptoms of which were tabulated in detail when first seen.

Of the 240 cases examined, 53% were males and 47% females, while 4 were of the colored race; 4 were solely breast fed and 2 were on mixed feedings. The ages of the patients varied from 5 weeks to 50 years, the following table showing the age incidence:

Under six months .....	5 or 2%
Six months to one year.....	16 or 6.6%
One to one and a half years.....	25 or 10.4
One and a half to two years.....	22 or 9.1
Two to two and a half years.....	35 or 14.5
Two and a half to three years.....	21 or 8.7
Three to three and a half years.....	23 or 9.5
Three and a half to four years.....	18 or 7.5
Four to four and a half years.....	14 or 5.8
Four and a half to five years.....	2 or .8
Five to six years .....	14 or 5.8
Six to seven years.....	12 or 5.
Seven to eight years.....	7 or 2.9
Eight to nine years .....	7 or 2.9
Nine to ten years.....	1 or .4
Ten to fifteen years.....	7 or 2.9
Fifteen to twenty years.....	3 or 1.2
Twenty to twenty-five years.....	5 or 2.
Over twenty-five years .....	3 or 1.2
Under one year.....	21 or 8.7
One to three years.....	103 or 42.9
Three to five years.....	57 or 23.7
Under five years.....	181 or 75.4
Five to fifteen years.....	48 or 20.
Over fifteen years .....	11 or 4.5

The greatest number in any half year, 14.5%, occurred between the 24th and 30th months.

The 100 cases were further classified sociologically, taking into consideration the character of the environment, the cleanli-

ness of the habitation, the ability to speak English, etc. Grouping them under the heading A, B or C, according to the previously mentioned qualifications, we find under A, the highest class, 14%, under B, 40%, and under C, 46%.

In no case was any definite predisposing factor found. At least 85% of the children were previously in good health, many of them being robust, and thus it would seem that susceptibility was not dependent upon any condition of previously lowered resistance. Neither scarlet fever nor any other infectious disease preceded the attack of poliomyelitis more than the average number of times and they apparently had no bearing upon the occurrence of the latter disease.

CLINICAL CLASSIFICATION—The classification found most convenient was predicated upon clinical findings, but had as its basis anatomical changes. It included in its broader aspect but 2 classes, paralytic and non-paralytic. The non-paralytic variety comprise the so-called abortive form and those cases evidencing only the symptoms of an acute infection, without central nervous system involvement.

Of the paralytic variety 2 forms were met with, the bulbo-spinal or common myelitic type, involving chiefly the lower motor neuron, and the encephalitic, in which the upper motor neuron was the site of the principal attack. The former is characterized by a flaccid palsy and the latter principally by spasticity.

Of the 100 cases mentioned in this series, there was one of the encephalitic and one of the non-paralytic form, the other 98 being bulbo-spinal. Of the latter the symptoms in 80 cases pointed to spinal cord involvement alone, in 14 to the bulb and cord and in 4 to the bulb alone. That this latter subdivision may be entirely fictitious is shown by reference to Case I. I., a 5 year old girl who, after a typical prodromal period of 3 days' standing, developed a right-sided facial paralysis. At the time of first examination it was thought that slight weakness of the left thigh was present, while the left knee jerk was very greatly reduced. Three days later no weakness in the legs was demonstrable and there was a definite response on tapping the left quadriceps tendon. Without doubt there was some spinal involvement in this child, but a few days after the onset the distribution appeared to be purely bulbar. Several cases with paralysis of one or more extremity had a suspicious flattening

of one side of the face or slight interference with swallowing or with speech, for a few days. These cases would ordinarily pass as examples of the spinal type of the disease.

Of the 100 cases, 4 were of the ascending type and 1 of the descending, both forms commonly referred to as Landry's paralysis. In the one example of descending paralysis, occurring in M. E., aged 25 years, the left arm was first involved, then the right arm, next the lower extremities, and finally the respiratory muscles and speech. The course of the paralysis occupied at least 6 days, there being a distinct remission after the first evidence of palsy appeared, as is seen so frequently in cases of this type. Death occurred 12 days after the onset, the sensorium remaining unclouded practically until the end. This mental condition is notable in poliomyelitis; one young adult, suffering from a progressive paralysis involving the respiratory muscles, directing the efforts to sustain his life with artificial respiration.

As pointed out by Draper, paralysis is the only undesirable result of poliomyelitis. Such being the case, it follows that the paralytic form is of the greatest interest to the clinician, though the non-paralytic and usually unrecognized cases are probably of the greatest moment in the spread of the disease.

ONSET—The clinical picture of poliomyelitis, in children at least, is one that runs surprisingly true to form. After a period of incubation of indefinite and probably varying length, but generally presumed to average about 8 days, the child is taken suddenly ill with certain fairly well defined symptoms. These last a variable time and are often followed by paralysis, which in turn is followed by a subsidence of the acute symptoms and improvement of the muscle weakness.

In every instance of 100 consecutive cases a history of some constitutional disturbance preceded the onset of the palsy. In no case did the child go to bed well and awake paralyzed. Even the least intelligent mother stated that the child was feverish and fretful, although in many instances the disturbance was so slight as to be practically disregarded at the time and its true significance only appreciated after the appearance of some loss of muscular power. In others the severity of the initial symptoms was pronounced, in some cases being out of all proportion to the extent of the succeeding paralysis.



The frequency of the symptoms of onset may be tabulated as follows:

Pyrexia in .....	100%
Constipation .....	87
Drowsiness .....	81
Neck stiffness .....	82
Anorexia .....	77
Irritability .....	66
Vomiting .....	44
Diarrhea .....	4
Headache .....	50
Backache .....	28
Pain in legs.....	46
Pain in arms.....	4
Restlessness .....	3
Sore throat .....	9
Bronchitis .....	4
Urinary retention .....	16

As a rule the symptoms of invasion in the paralytic cases continued without much abatement through the pre-paralytic period, but in some instances there was a distinct diminution in their severity after the first 12 or 24 hours. Others, usually the severer cases, became progressively worse throughout the period of invasion. Still others showed a remission shortly after the onset, then a recrudescence at the time of appearance of the paralysis, the dromedary group described by Draper.

The elevation of *temperature* was constant and is without doubt the most frequently met with symptom of the disease. Oftentimes this was the first and sometimes the only manifestation noted by the mother. Occasionally fever was not noted until the second or third day, but the accuracy of these observations may well be suspected, as in very few instances was a thermometer used. The average temperature of 42 cases, sick 4 days or less, upon their arrival at the hospital was 100.5°, the highest being 103.2°, 8 of them being normal. The duration of the higher temperatures was usually but a few days after the onset of the paralysis, though a very moderate amount of fever

often persisted an unusual length of time, in some instances for 3 weeks after admission, without apparent cause. In several instances the children had normal temperatures as early as the third or fourth day after the onset, although it was definitely stated that there had been fever at first. *Chills* were noted but once, and this agrees with the experience of others who state that they are rare or absent.

The *pulse* was usually rather fast, ranging about 100 and not infrequently above 120. The *respirations* were not increased out of proportion to the amount of temperature present. In some cases with involvement of the respiratory apparatus there was an increase in the rate, in others a decrease.

*Sweating* has been mentioned as occurring with great frequency in poliomyelitis, Müller stating that it was a marked feature in 75% of his cases. In our experience the number of children showing marked sweating was not large, but the disease was certainly characterized by a moistness of the skin that was pronounced enough to be noticeable. In those cases seen while the acute symptoms were at their height, even the mildly sick would show a beading of perspiration on the forehead or along the upper lip, while the bed clothing would often be appreciably moist. Agar states that the excessive sweating sometimes seen is the result of a disturbance of the special centers controlling that function.

*Constipation* was another quite constant feature of this disease, it being met with in 87% of cases. In some instances obstipation occurred, the greatest difficulty being encountered in getting any intestinal action. *Diarrhea*, on the other hand, was only seen in 4 cases, and 1 of these had an alternating constipation. During convalescence, in a number of cases, constipation became a serious complication. In several children it was necessary to break up rectal concretions manually. In these instances a paralysis of the bowel was probably present.

Of other gastro-intestinal symptoms, *vomiting* was rather prominent, though it was seen in less than half of the cases. The number of times that emesis occurred varied from once to very many times over a period of several days. Of the 41 cases that vomited, 16 did so only once, 6 two or three times, 3 "very much." In the remaining 19 no record was made of the severity. In our experience vomiting was not often the first

symptom, fever preceding it practically always. In a few instances vomiting did not occur at the onset but several days later.

*Anorexia* was stated to be present in 77% of the cases, but was not very marked as a rule, nor lasting long. With the decline in temperature the appetite quickly returned to normal.

As a rule the *nutrition* suffered but little. Some loss of weight occurred during the early days, but it was soon regained and in a surprisingly short time the physical condition of these children was as good as ever, sometimes much improved, probably as a result of painstaking hospital care. In the non-paralytic cases no bad end-results occurred. Only the paralyzed children bear with them evidence of what has gone before.

Of the symptoms referable to the nervous system, *stiffness of the neck*, the anterior spinal flexion sign of Peabody, Draper and Dochez, took the first rank. This sign was definitely present, in varying degree, in 82% of the cases, while in the other 18% its absence could not be proved, the children being seen for the first time after the ebb of the acute symptoms. If the hand was placed under the occipital region of the recumbent child and the head gently lifted, the neck, instead of flexing and permitting the chin to approach the chest, remained more or less rigid and the trunk was lifted from the bed. Ordinarily this movement caused pain and the child cried out. If the other hand was placed on the chest and raising of the trunk prevented, the pain on attempting flexion was increased. Retraction of the head was not often present, though rigidity was sometimes marked. In some instances, however, the head was held as far back as in a meningeal inflammation. Even those children who had a very pronounced weakness of the back and neck muscles showed neck stiffness. The length of time that this stiffness persisted varied, but even in the mild cases it lasted several days, being one of the last of the acute symptoms to disappear. Fraser records its duration as 3 weeks in at least one instance. There did not seem to be a relation between the degree of neck stiffness and the condition of the spinal fluid, several cases showing a marked degree of rigidity with a spinal fluid under little if any increased pressure.

Pain was a prominent symptom of the stage of onset. Fifty cases complained of *headache*, while 43 were unable to say

whether it was present or not. *Backache* was noted in 28 instances, but 51 children were too young to indicate its presence or absence. Pain in the legs was present in 46%, in the arms in only 4%. However, 37% could not say regarding that symptom. In a few of the older children abdominal pain was the chief complaint.

*Hyperesthesia* was apparently a marked feature of those cases seen in the acute stage and it would seem that such sensitiveness is perhaps an essential part of the clinical picture. When handled the majority of children cried out, giving the impression that tenderness to motion was present, although the element of fear might have been responsible for the apparent sensitiveness in children, it often being difficult to distinguish between spontaneous pain and tenderness. Hyperesthesia of the skin was not noticed, but the pain or tenderness was rather in the deeper structures of the limb, in the muscle bellies and tendons, and around the joints. The neck region was almost always sensitive to attempted flexion. In older children a favorite situation for induced pain was the ham-string tendons and sometimes the feet were complained of. Several children who had been sick only 3 or 4 days did not resent manipulations, but usually the mother felt sure that pain had been present at the onset.

*Irritability* was a frequently noticed condition, these children being particularly cross after awakening, some of them extraordinarily irritable. Possibly the sensitiveness to handling was in part responsible for this. Several of the most irritable children suffered from bulbar lesions.

*Drowsiness* was an even more prominent symptom, occurring in 81% of cases and usually lasting from 2 or 3 days to a week or more. The sleep was not deep as a rule, the children waking easily, usually in a querulous mood, and soon falling into a doze again. In a small number of cases the psychic inhibition was so marked that meningitis was suspected, but even apparently semicomatose children could easily be aroused. The mental condition of these children was good, despite the drowsiness. When aroused they were perfectly orientated and their judgment was not impaired.

*Restlessness* was stated to have been present in only 3% of the cases.



Among other symptoms referable to the central nervous system may be mentioned *convulsions*. These were of infrequent occurrence, having been seen in only 2% of this series. This accords with Fraser's experience, who saw convulsions only once in 90 cases.

*Muscular twitchings* and *tremors* were uncommon in our experience, though occasionally they were said to have occurred. Usually it was a rather coarse, jerky tremor that was noticed, probably the result of central irritation. Fraser reports them in 20 of 90 cases, as sudden short movements, either of flexion or extension of a limb, and frequently in an extremity that subsequently became paralyzed.

*Respiratory symptoms* were remarkable because of their absence, in only 4 of our cases a bronchitis being noted and in 9 a sore throat. One of those included among the 4 having bronchitis later developed a broncho-pneumonia and died of that complication. In one instance a purulent conjunctivitis was present and in one a nasal discharge was found to be diphtheritic in origin, but the cases of this series were remarkable for the absence of nasal discharge, very few showing it.

*Urinary retention* was a noticeable feature in 18% of the cases, but in none of them was it particularly pronounced. In one instance no urine was passed for 24 hours. This condition was apparently not due to a paralysis of the bladder, because in every instance it cleared up within a few days and probably depended upon some transient disturbance of innervation.

*Kernig's sign* was occasionally slightly suggestive in these children, but the explanation of its presence probably lies in voluntary contraction of the muscles due to the pain induced by complete extension of the hamstring tendons rather than in rigidity of the muscles themselves. The occasional presence of Babinski's and Oppenheim's signs indicated irritation of the lateral motor pathways through extension of the pathologic process in the cord.

*Weakness* of one or more muscle groups was occasionally seen as a precursor of paralysis. Though no definite palsy could at this time be demonstrated in a limb which later was found to be paralyzed, yet it would not bear the child's weight, causing him to limp or fall. Such weakness is probably the first peripheral evidence of the process going on in the spinal marrow.

The *reflexes* in the preparalytic stage are of interest. Unfortunately it was not our good fortune to observe many cases during this time, but the few cases which we did see showed quite marked increase of the knee jerks. Other deep reflexes were likewise increased. Before the onset of paralysis, in a majority of instances, the reflexes of the extremity to become involved disappear.

An *ataxic gait* was noticeable in the preparalytic stage in children who were old enough to walk. The ataxia was not so extreme that the children fell, but they walked uncertainly, and much preferred not to make the attempt.

The *duration* of the preparalytic stage in our series of cases ranged from about 12 hours to 9 days. The length of the period is shown in detail in the appended table. In no instance was the paralysis the first evidence of the trouble, every case giving a history of some disturbance, oftentimes very slight, preceding the paralysis.

Paralysis appeared on the same day in	4 cases.
Paralysis appeared on the 1st day after the onset in	13 cases.
Paralysis appeared on the 2nd day after the onset in	25 cases.
Paralysis appeared on the 3rd day after the onset in	28 cases.
Paralysis appeared on the 4th day after the onset in	14 cases.
Paralysis appeared on the 5th day after the onset in	11 cases.
Paralysis appeared on the 6th day after the onset in	2 cases.
Paralysis appeared on the 8th day after the onset in	1 case.
Paralysis appeared on the 9th day after the onset in	2 cases.

PARALYSIS—That the advent of paralysis in poliomyelitis, when it occurs, is not long delayed, the preceding table shows, 70% occurring by the third day and 95% by the fifth day.

The paralysis was most often ushered in suddenly, loss of function developing quickly and often without apparent knowledge of the fact by the patient, certainly without any increase in the amount of pain that was suffered. The initial involvement in the majority of cases proved to be the final paralysis.

The protean character of infantile paralysis as an affection of the central nervous system is no better shown than by a consideration of the various combinations of muscle groups involved in the paralysis. Disregarding back and neck weaknesses, there were, in 100 consecutive cases, no less than 42

different arrangements of the muscle groups implicated. While in the greatest number of instances the lower extremities alone were involved, there were many fantastic combinations met with, as paralysis of the right shoulder and left leg; of both thighs, both legs and the left forearm; of both arms, the face and the left thigh; of the right shoulder, both thighs, the left leg and the external rectus of the right eye.

The most frequently involved regions are shown by this table:

Right thigh and right leg.....	13 times.
Both thighs and both legs.....	10 times.
Both thighs and right leg.....	10 times.
Left thigh and left leg.....	8 times.
Right thigh alone.....	5 times.
Both upper and both lower extremities.....	5 times.
Right arm .....	5 times.
Left arm .....	3 times.
Both thighs and left leg.....	3 times.

Neither the left nor both peronei alone were implicated in any case.

The lower extremities were involved alone in 55% of cases and the upper alone in 11%. In 82% of all cases one or both legs were affected, as compared with 85.64% of Peabody, Draper and Dochez series. The number of times that the face was involved was not large, only 11%, but in several instances it was suspected of being included in the paralysis, though it could not be definitely determined. Fraser reports 31 of 90 cases with facial paralysis, that being the only symptom in 5 instances. In only 3 instances were the respiratory muscles affected at the first examination, yet several of the 100 patients died of a respiratory paralysis of later development. Mild degrees of respiratory involvement are easily overlooked and may be the beginning of a lethal termination. The eyes were not frequently implicated, there being an internal strabismus once, an enlarged right pupil once and an enlarged left pupil 3 times. Swallowing was affected 4 times, speech 3 times and the spincters and intercostals once each.

Weakness of the neck and back were common, but were almost never permanent, the majority apparently completely recovering within a few days or within 2 or 3 weeks. Children

whose heads fell back almost to the spine during the acute stage or who could not begin to lift themselves, within a comparatively short time were able to sit up in bed, to stand up and to support the head in the most natural manner. This makes one suspect that weakness in this region may be more apparent than real and possibly dependent upon pain, or that back weakness is a symptom of a general infection, rather than a manifestation of a lesion of the cord. The severely paralyzed children, however, do not recover in such a ready manner, and in them the back and neck may remain weak for a long time, but one is inclined to think that even here recovery of those muscles is likely to be earliest and greatest.

Paralysis of the neck and back may be the only lesion, as in a case observed by us, but this form of paralysis is rare. This was the only instance in over 200 where these groups alone were involved, confirming the statement of Batten, that paralysis of the neck muscles without involvement of the bulb or of the shoulder girdle is very uncommon. Unilateral paralysis of the back caused the spine to bend toward the weak side.

As a rule, in paralysis of the upper extremity, even though the girdle muscles were almost completely paralyzed and those of the arm were often severely involved also, yet the forearm groups very frequently showed some power, so that the child was often able to move the fingers and sometimes make a slight flexing effort at the elbow. Return of power is also likely to be first manifest in the muscle group distal to the body. In the lower extremities, with complete involvement of one or both legs, it was often noted that the toes could be moved. In some instances the shoulder involvement was only temporary, complete recovery following. Some of these transient palsies are the result of functional disturbances, due to toxemia or to the pressure of the contiguous inflammatory products upon the cells of the anterior horn.

Occasionally tenderness caused a child to keep a limb that was not affected at rest, simulating a paralysis.

The attitude of the child after the advent of the palsy depends upon the severity and the distribution of the latter. Usually he lies on the back without making any effort to move, the face clearly showing in those suffering much hyperesthesia, that the approach of the examiner causes apprehension.



Francis calls attention to the fact that these children, when severely paralyzed, lie motionless, moving the eyeballs, but not the head, often acutely attentive to all that is going on. Occasionally the more easily frightened child will attempt to turn on his side, but seldom is an effort made to sit up in bed. If the legs are involved there is apt to be an eversion of the limbs with slight flexion, described as a frog-like position. Paralysis of the peronei causes the toes to droop in a suggestive manner and the ordinary movements of the legs that one would expect from a child whose mentality is unclouded, do not evidence themselves. When the arms, one or both, are involved, it is usually immediately noticed that such is the case. If the child is watched for a moment or two, it is seen that the unaffected arm is moved as usual, but the paralyzed arm lies more or less motionless, often in a position of extreme pronation, especially when completely involved.

In the milder cases it is more difficult to bring out the muscle weakness, as in these instances only a paresis is present and the limb can be moved. In the sitting position children do not make as good an effort at flexing the leg as they do when lying down. Then, if the sole of the foot is gently pricked, the ankle being firmly grasped, the lack of effort on the part of the affected muscles may be demonstrated. In older cases mild weakness of the thigh muscles are often easily seen in the inability of the child to climb stairs.

To bring out a peroneal weakness the ankle should be held so that the thigh may not be flexed. On pricking the sole of the foot the uninvolved toes are immediately lifted, but the paralyzed digits remain in a position of slight extension. Occasionally the child's efforts to escape the pin result in a further extension or in flexion of the toes of the other foot. Inability to stand on one tiptoe, in an older child, easily demonstrates slight degrees of peroneal weakness. Mild arm palsies in young infants are hard to establish, movements of the arms being incoördinate at the best and muscle power slight.

Return of power to the affected muscles sometimes makes recognition difficult, particularly in very young children, in whom it is not as easy to demonstrate muscle weakness, their response to irritation often not being definite.

It was noted in a large number of cases that if one muscle group was markedly affected, an adjacent group was also affected but in a lesser degree. Thus involvement of one quadriceps was accompanied by weakness of the other quadriceps or of one peroneal group. Paralysis of both quadriceps was shared to a lesser degree by the peronei; if both legs were affected above and below the knees, the back was sure to be involved or one arm partly affected.

Respiratory paralyses were seen in only 3 cases: the first, that of a young man in whom the diaphragm was completely involved when first seen on the sixth day of the disease, this being soon followed by paralysis of the accessory muscles; the second, in which the intercostals and diaphragm were involved practically at the same time, artificial respiration keeping the child alive for 44 hours; in the third case, the intercostals were involved and severely so, but in this instance a return of function and recovery followed. Persistence of the intercostal palsy is followed by atrophy of the muscles, protrusion of the abdomen and a marked narrowing of the chest. Respiratory paralysis was never the only palsy present.

**KNEE JERKS**—Tabulation of the presence or absence of the knee jerks gives the following results:

Type of Paralysis	Number of cases	Right knee jerk		Left knee jerk		Both knee jerks	
		Present	Absent	Present	Absent	Present	Absent
Bulbar	4					3	1
Upper extremity alone or with the bulb.	14	1		1		10	3
Lower extremities with or without upper or bulb.	82	8	12	12	8	8	54
Total	100	9	12	12	9	21	58

Summarizing these figures on the knee jerks, we find:  
 1—That the absence of knee jerks in cases apparently purely bulbar, or involving the cervical cord, indicated that there was probably some pathologic process in the lumbar region as well.  
 2—That in the cases involving only one lower extremity, the knee jerk in the unaffected limb was present in 67% and present in the affected limb in 18%, thus indicating that absence of the knee jerk in an affected leg is not a requisite, the presence of a

reflex being compatible with partial paralysis of one or more muscle groups of the limb in question.

The explanation of these latter cases probably lies in the fact that a given muscle receives its nerve supply from several levels of the cord or that the unusual distribution or slight involvement of the pathologic process in the anterior horn spared certain association fibers which served to carry on the function of the reflex arc. Exaggeration of the reflexes on the sound side occurred not infrequently.

The general symptoms during the period of paralysis were practically a continuation of those seen at the onset. The temperature at this time was usually moderate in amount, however. It was noticeable though, how long, in some instances at least, the temperature remained slightly elevated. For days there was a record of 98.8°, 99.6° or possibly 100°. Finally the normal was reached and further rises were seldom seen. The drowsy condition of the sensorium persisted for a few days, in the severer cases for a week or more, while neck stiffness was to be found almost constantly. Pain and tenderness was a well marked complaint for several days, in some cases being so pronounced as to justify the term "neuritic form," in others being much less pronounced. In some instances the tenderness in the muscle bellies and the tendons, particularly in the hamstrings, persisted for weeks. The bowels remained constipated, and the tongue was mildly coated, but herpes labialis was rarely seen, appearing in only 1 case of our series.

In the course of a few days, or a week or more, the acute symptoms began to decrease; the pain and tenderness became a less prominent feature; the irritability subsided, though this sometimes persisted unusually long; the drowsiness and tendency to excessive dozing was replaced by a more nearly normal manner of sleeping and the children again took an interest in their surroundings. Before long they began to make efforts to get up and in a short time they were often sitting, if not standing in their cribs, the improvement in their physical condition being prompt.

NON-PARALYTIC CASES—Our opportunities for seeing this class of cases were few, not over half a dozen being observed and a positive diagnosis made in only a proportion of those.

The name abortive is commonly applied to these cases, a term which Agar would confine to those showing no evidence of central nervous system involvement. Many observers are inclined to believe that the non-paralytic cases outnumber the paralyzed, figures as to the frequency ranging from 1 or 2 non-paralytic to every 4 that are paralyzed, up to 25 of the former to every one of the latter. What the proportion actually is, we have no means of estimating, but that non-paralytic cases exist (both abortive and with evidence of meningeal involvement but without palsy), and in considerable numbers, is beyond doubt, many investigators demonstrating by laboratory methods that the sera of these cases are viricidal. Anderson and Frost, Netter and Levaditi, and others have all shown that the serum from these children just as surely neutralizes the virus as does that from the frankly paralyzed.

**BULBAR PALSIES**—This form of the disease is rarer than the spinal, 18% of our 100 cases showing involvement of the medulla or pons at the first examination. Others have reported a much greater incidence of this type of the disease, but their opportunities for observation over a longer period of time were greater than ours. Many bulbar palsies are not of long duration and hence careful watching is necessary to detect them. In other instances facial involvement may be so slight that it is difficult of recognition. When a bulbar palsy occurred alone it seemed that it was much more likely to be persistent than when it occurred in conjunction with spinal paralysis.

In 11 instances of this series the face was involved, once being the only lesion, in others in combination with paralyses of the upper or lower extremities or of the ocular apparatus or as a part of a general paralysis. It was noticeable that the facial paralysis was never bilateral, but involved only one side of the face. In 2 instances the whole facial nerve was affected, with inability to close the eyelid on the same side, in the others the upper part of the face was not involved.

The return of power in paralyzed pharyngeal muscles, as was occasionally seen, is not an unusual occurrence, the same marked improvement being noted after involvement of speech. In our series there were not noted any very extensive ocular palsies, such as a complete ophthalmoplegia externa, as has been



reported. No examples of nystagmus were seen, nor was sight interfered with, as near as could be determined. In no instance was ophthalmoscopic examination made, so that abnormalities of the optic nerves were not discovered. According to Müller, loss of sight marks the case as other than poliomyelitis. Neal and Dubois, however, report 2 cases with blindness, 1 of which recovered the sight at the end of the third month.

**CEREBRAL TYPE**—This rare and baffling form of poliomyelitis was first described by Strümpell in 1885. Since then several have described instances of this type, Medin in 1898 describing 3, Harbitz and Scheel, Mobius, Hoffman, Krause, Zappert, Müller and Peabody, Draper and Dochez all reporting from 1 to 24 cases with cerebral features. We had the opportunity of observing 3 cases, 1 of which was undoubtedly an example of the cerebral form, the second might well have been, while the third was doubtful.

G. N., aged 19 months, had a dysentery for 2 weeks preceding his admission to the hospital. During this time he had considerable temperature also. On September 6th, at 6 in the morning, it was noticed that he was feverish but he nursed well, soon falling asleep. At 8 o'clock, when he awoke, he was "stiff all over," and was not able to use his right leg. Physical examination showed a spastic condition of both sides of the body, most marked on the right side, with increased reflexes. His temperature was  $102.4^{\circ}$  and later reached  $104.6^{\circ}$ . 25 days elapsing before it permanently staid at normal. The spinal fluid was under considerably increased pressure, but was negative to the Nonné test and only contained 2 cells per c. mm. This case was thought to be without doubt an example of cerebral poliomyelitis.

D. T., aged 4 years, previously well except for "bowel trouble," was taken very sick on September 5th with a temperature of  $104^{\circ}$  to  $105^{\circ}$ , vomiting, constipation, drowsiness and pain in the arms. A day later there was noticed a paralysis of the right arm and both legs. On examination the muscles of the back, neck and both extremities were found to be spastic, most marked on the left side. The extensors of the wrist and fingers were both weak, and there was fibrillary twitching of the muscles of the right face, forearm and leg. The tongue pro-

truded slightly to the right and the reflexes were all present, about normal on the left, brisk on the right side. The spinal fluid showed 20 cells to the c. mm., but a negative Noguchi was found. The white count was 17,000, with 80% of polymorphonuclears. This was an encephalitis, unquestionably, but whether the causative organism was that of poliomyelitis, cannot be proven.

The third case was rather doubtful. This 11 months' old boy was taken sick in the midst of perfect health, with convulsions which lasted the better part of a day. On emerging from these it was seen that his entire right side was paralyzed. The type was spastic with increased reflexes.

Strümpell describes the disease either with or in some instances without a prodromal period. A sudden onset with fever, vomiting and convulsions mark this stage, after which a hemiplegia or a paraplegia, with increased reflexes, is noted. Involvement of a cranial nerve often formed the connecting link between the cerebral and spinal forms of the disease. The occurrence of spastic and flaccid paralyses in the same epidemic or in members of the same family, indeed in the same child, are reported. That these cases may be examples of encephalitis of influenzal or pneumococcic origin must be admitted, but at present we are unable to arrive at a definite conclusion.

BLOOD—In 136 cases a white cell count was made, either in the first or second week as a rule, sometimes not until the third week. In nearly every case there was a white count above the upper limits of the normal. The lowest count was 6,500, the highest, 42,000. Two other counts were below 7,500. In one the child had been sick 7 days, the temperature was 99.6° and the white count 7,350. The second had been sick 7 days, the temperature was 99° and the count 7,200. The child with the lowest count, 6,500, had been sick 9 days and the temperature was normal. Several cases which had been sick 10 days or longer had counts over 15,000, while several with a normal temperature on admission to the hospital had white counts ranging from 12,000 to 18,000.

It seemed that the sickest children had the highest leukocyte counts. As seen by the appended table, the severely ill and many of the fatal cases had high counts:

*Very Ill Children*

Name	Temperature	Paralysis	White Count
Raymond M.	103.4° to 105.4°	Right side of face, neck, left quadriceps and peroneus.	40,500
James S.	101.2° to 103.4°	Right side of face, right arm and leg.	23,600
Jennie K.	100.0° to 103.2°	All 4 extremities and muscles of respiration.	26,750
Walter G.	98.6° to 100.0°	All 4 extremities, back and neck.	19,600

*Lethal Cases*

Emma P.	32,200
Eldona I.	42,000
Hazel N.	26,300
Howard A.	41,600
Fannie B.	24,300

None of the other children who died had white counts made. Some of the children with high temperature did not have an excessive leukocytosis, while some suffering from mild attacks and with practically no temperature had high counts. But in general we may say the higher the temperature or the more severe the paralysis the higher the white count.

If the white counts are arranged according to the frequency in each period of 2,500 up to 20,000 and in each 5,000 period above that, we find that the greatest number of cases, 39, fall in the group 12,500 to 15,000; the next greatest number, 27, fall in the group immediately below, 10,000 to 12,500; while the third largest number, 23, fall in the group 15,000 to 17,500. Two-thirds of the cases had a white count somewhere between 10,000 and 17,500. The *differential counts* did not show anything of particular interest. Only 67 counts were made. Tabulated according to percentages, the polymorphonuclears were most commonly found between 60% and 70%, the lymphocytes and large mononuclears between 10% and 20% and the eosinophiles at 2%. The relation between the white count and the

differential count was fairly constant, the average of the 18 highest polymorphonuclear counts being 77%, and of the corresponding white counts, 20,700. The average of the 18 lowest polymorphonuclear counts was 44, and of the corresponding white counts, 13,600.

Summing up the blood findings, we find that there was in almost every case a leukocytosis which ranged commonly between 10,000 and 20,000; that the sickest children and those who died had the highest white counts; that the differential increase was in the polymorphonuclears, the greatest proportionate increase in the latter occurring with the higher white counts, the lowest with the lower counts. All ages showed an increase in the white cells and there did not seem to be any marked influence played by age upon the differential count. Some infants under 1 year had a higher polymorphonuclear count than other children 4 or 5 years old, conditions of temperature, extent of paralysis, etc., being fairly equal.

Our experience corroborates the findings of the Rockefeller Institute workers, who report the blood findings in 59 cases. They found a constant leukocytosis as high as 30,000 and a leukopenia in only 1 instance. The polymorphonuclear cells showed a constant increase also of from 10% to 15%. The large number of instances of leukopenia, reported by Müller, certainly was not duplicated in this series.

URINE—Urinary examination in over 200 cases of poliomyelitis were notable for the negative results. In only 1 instance were albumen and casts found, and poliomyelitis may be considered as a disease that is singularly free from renal complications.

CEREBROSPINAL FLUID—136 examinations of the cerebrospinal fluid were made in cases of poliomyelitis. These samples of fluid were recorded as to the following facts: The pressure, the clarity, the amount withdrawn, the presence or absence of globulins, the number of cells per cubic millimeter and their character. In many instances not all of these facts were recorded, particularly if the fluid was bloody, when only the degree of pressure and amount of fluid were inscribed. In several instances the fluid was not tested for the presence of globulin nor was the nature of the contained cells recorded. For this



reason it would seem better to speak in percentages. In only a few instances was the reducing power noted. These fluids were examined by several different individuals and thus are of value only in a general way, but it will be noticed that the findings agree rather well with those of experienced observers who supposedly have developed a technic and a standardized method of estimating the value of the various factors of interest.

In 121 instances the pressure was noted as not increased in 50%, slightly increased in 43%, markedly increased in about 7% and under great pressure in 1 case. The maximum amount withdrawn was 30 c.c., the average being 12 c.c. The number of cells ranged from 1 per c. mm. to 630 per c. mm., the highest number in a spinal fluid uninfluenced by the use of serum intraspinally. There was apparently no connection between the severity of the case or the height of the temperature and the number of cells in the spinal fluid. One or two very ill children had high cell counts, others severely sick had very moderate counts. Nor did the spinal fluid count in any way agree with the blood count.

Arranged in tabular form, showing the number of cases with a cell count under 10, from 10 to 25, 25 to 50, etc., it will be seen that the cell count of greatest frequency falls within the grouping 10 to 25.

Under 10 cells per c. mm.	19
10 to 25 cells per c. mm.	35
25 to 50 cells per c. mm.	28
50 to 75 cells per c. mm.	18
75 to 100 cells per c. mm.	8
100 to 150 cells per c. mm.	7
150 to 200 cells per c. mm.	3
200 to 300 cells per c. mm.	4
300 to 400 cells per c. mm.	3
400 to 500 cells per c. mm.	1
Over 500 cells per c. mm.	1

50% of cases had a cell count between 10 and 50 per c. mm. and 78% under 75 per c. mm. Thus we see that a rather moderate cell count is the rule. It must be remembered that these counts for the most part were made after the end of the first week and

some as late as the third week. Generally speaking the counts made late in the disease tended to be lower than those made during the height, but it was noticeable that a cell count above the normal of 10 to 12 per c. mm. tended to persist throughout the disease. These counts agree with those of Peabody, Draper and Dochez, who found in their painstaking examination of 233 fluids from 69 cases, only a moderate increase in the cells.

The globulin reaction was positive in 61%, in 2 of these markedly positive, in 1 doubtful. In the remaining 39% globulin tests were negative.

The character of the cells was not noted in all instances, but out of 60 records made covering this point, they were chiefly lymphocytes in 58. The percentage of these cells was noted as ranging from 76 to 100. In one instance the percentage of polymorphonuclears was 52. After the intraspinal injection of serum the character of the cell count changed from that of a lymphocytosis to a polymorphonucleosis of about 85%, and at the same time the count was usually greatly increased.

Only one fluid, not contaminated with blood, was slightly cloudy. The rest was clear. The so-called syndrome of Froin (spontaneous coagulation) was not seen in any instance.

In only 14 of 131 cases was the fluid examined and recorded as negative, there being neither increased pressure, a cell count over 12 per c. mm. nor a positive globulin test.

SEVERITY—The following table shows the classification of 100 cases according to the estimated severity at the time when first seen:

Very mild .....	9
Mild .....	38
Moderately severe ....	34
Severe .....	17
Fatal .....	3

Of these 100 cases, 8 died, the lethal outcome being apparent in 2 and recorded as probable in 4 others. The remaining 2 were regarded as mild, and death did not occur until the 19th and 21st days respectively, in 1 instance from vulvar noma.

MORTALITY—Of 240 cases, 33 or 13.74% died. In 30 instances in which the onset was definitely known, death occurred in 10, or  $\frac{1}{3}$ , by the 4th day, and in 21 or 70%, by the 10th day.

The appended table shows upon what day of the disease death occurred:

On the 1st day in.....	1 case
On the 2nd day in.....	1 case
On the 3rd day in.....	2 cases
On the 4th day in.....	6 cases
On the 5th day in.....	2 cases
On the 6th day in.....	4 cases
On the 7th day in.....	1 case
On the 8th day in.....	2 cases
On the 9th day in.....	1 case
On the 10th day in.....	1 case
On the 11th day in.....	1 case
On the 14th day in.....	1 case
On the 19th day in.....	2 cases
On the 20th day in.....	1 case
On the 21st day in.....	1 case
On the 22nd day in.....	1 case
On the 25th day in.....	2 cases
On the 31st day in.....	1 case

The death rate at the different ages showed great variations. While the death rate for all ages is 13.74%, of those under 1 year 24%, and of those over 15 years 36% died. The following table shows the death rate during each year or period of years:

Under 1 year old .....	5 of 21 or 24	per cent. died
Age 1 to 2 years .....	5 of 47 or 10.6	per cent. died
Age 2 to 3 years .....	7 of 56 or 12.5	per cent. died
Age 3 to 4 years .....	3 of 41 or 7.3	per cent. died
Age 4 to 5 years .....	1 of 16 or 6.3	per cent. died
Age 5 to 10 years .....	5 of 41 or 12.2	per cent. died
Age 10 to 15 years .....	3 of 7 or 43	per cent. died
Age 15 to 20 years .....	0 of 3	
Age 20 to 25 years .....	2 of 5 or 40	per cent. died
Over 25 years old .....	2 of 3 or 66	per cent. died

The death rate is apparently greatest at the extremes of life, 1 in 4 children under 1 year of age dying, the rate declining to about the 5th year, then becoming markedly higher until two-thirds of those over 25 years of age succumb. This agrees with

the findings of Lovett, who states that the mortality in older children and adults is higher than at other ages. The following table from the same author shows the experience of others in this respect:

	AGE	DEATH RATE
Wickman	12 to 32	27.5 per cent
Leegaard	15 to 30	25.8 " "
Furntrat	Over 15	25.5 " "
Lindner & Mally	Over 11	50. " "
Massachusetts, 1910	Over 10	20. " "

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MULTIPLE SCLEROSIS AS A COMPLICATION OF WHOOPING-COUGH (*Riv. di Clin. Pediat.*, 1915, xiii, p. 773. G. Zamboni). A girl, aged 5½ years, was attacked with whooping-cough which ran a regular course for 4 months and then became more violent, the paroxysms being accompanied by hæmorrhage from the mouth and nose. After a further 3 months, psychic disturbances, scanning speech and difficulty in walking were noticed. Other symptoms characteristic of multiple sclerosis then developed. Treatment with iodides resulted in an increase of more than 1 kilo in weight in a month, after which the patient left the clinic.—*The British Journal of Diseases of Children.*



# THE EMOTIONAL LIFE OF THE CHILD \*

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Accurate descriptions of the emotional reactions of children have been written by tireless observers, notably Compayre, E. and G. Scupin and M. W. Shinn, portraying the appearance of the first evidences of smiling, anger, resentment, affection and cruelty. These authors, however, have been generally content in recording what they observed, without attempting interpretations of their findings. Broadly speaking they all recognize that the emotional reactions in infancy are dependent upon pleasurable or painful sensations which the infant experiences as a result of his act. Thus Compayre writes, "The first pleasurable sensations originate in the progressive moderate use of the organs of sense and the gratification of bodily wants."

Among the most primitive of physical acts are the intake and evacuation of nutriment. Although other observers had long noted the satisfaction which the new-born babe derived from partaking milk at the mother's breast, some 15 years ago Freud published new theories concerning the source of pleasure in the performance of alimentary functions and of other muscle movements. In contradistinction to most of his predecessors, he attributed to alimentation and muscular movement a precursory sexual significance, and it is the emotional life of the child in the light of Freud's theories that we shall consider here.†

Antedating Freud, in 1879, Lindner called attention to the fact that the infant often practices suckling with an eagerness which completely absorbs its attention, even though its appetite for food has been completely appeased. He also emphasized that at times this suckling independent of appetite for food is performed with a progressively increasing intensity, which culminates in a climax that resembles an orgasm. After such an episode the child often falls quietly asleep, presumably as a result of self-gratification from the act, even when hunger is not in question.

\*Read by invitation before the Section on Pediatrics, New York Academy of Medicine, March, 1917.

†The reader is referred to H. von Hug-Helmuth, *Seelenleben des Kindes* (Deuticke), 1913, for a more extensive study of this topic.

He even ventured the opinion, basing his idea upon grasping movements which he noted some infants performed with their hands during such suckling (which it seems best to designate as *culminative suckling*), that this act constituted a fleeting, transitional forerunner of future masturbation. In other words, he considered it as possessing a precursory sex significance.

Freud assented to this sexual conception of culminative suckling advanced by Lindner, but in addition pointed out that such suckling was not primarily objective; that is, that its effect was not due to any pleasure derived by the infant from action in suckling upon the mother. He maintained that it is auto-erotic, i. e., dependent upon pleasure which the infant experiences from the sensations of the act through its own lip and mouth movements.\*

In the second place he maintained that this most elementary indication of future sexuality, "culminative suckling," is not an independent manifestation, but is closely associated with that suckling which the child first learned in satisfying its hunger, obviously for the maintenance of its existence. Culminative suckling should thus be considered only as an altered form of the necessary and agreeable sensations connected with hunger suckling.

In the third place the satisfaction from culminative suckling is dependent upon the erogenous sensibility of the zone which includes the mucous membrane of the mouth and lips. Naturally Freud recognized that the gratification obtained from nutritional intake and the erogenous satisfaction from muscular stimulation of the buccal zone, cannot be succinctly separated in the initial stages.

Moreover, he agreed that the erogenous quality of the labial mucous membrane varies greatly in degree in individual children, for it is quite obvious that the tendency to suckling independent of food intake is strikingly variable in different infants. It is necessary to refer only casually to well-known buccal practises, e. g. the "soul kiss" and sexual buccal perversions in adults, to substantiate the fact that later in life a reversion for sexual gratification to what is designated by Freud as originally an infantile erogenous zone, i. e., the mouth, may occur.

\* K. Abraham, *Zeitschrift für Aertzliche, Psycho-analyse*, Vol. 4, No. 2.

Freud also ascribed a double function to the evacuation of waste products from the intestinal tract, just as he had to the ingestion of food into it. He believed that the act of excretion from the rectum aside from its accepted physiological function, not infrequently served the young child as an auto-erogenous source of pleasure. He asserted that those sensations which necessarily accompany defecation may become so agreeable to some children that they voluntarily attempt to repeat them, or by "holding back" seek to prolong and intensify those sensations which accompany the act.

The acts performed in connection with the anal zone also vary in their erogenous significance with each individual. On the whole, however, ano-erotic manifestations do not vary widely in their affective emotional value from culminative pleasure suckling and may closely approach, through the stimulation of erogenous impulses, the equivalent of true genital masturbation.

Thus, during the first few months of life, according to the psycho-analytic school, the chief sources of pleasure for the infant are almost exclusively dependent upon the movement of its own muscles and upon the stimuli it receives from its own mucous membranes. Especially these latter are considered of rudimentary sex significance.

Intimately associated with the skin and muscle erotism, but appearing at a somewhat later date, is the pleasure won by the child from the earliest precursors of inflicting and submitting to pain, such as biting the breast or having its cheeks pinched. Although in very early life each of these tendencies is very meagerly developed, later they are definitely incorporated into the service of sex, actively in the male, passively in the female, for the purpose of procreation.

We are here concerned with the precursors of normal components of sexuality. Ordinarily, the evidences of developing sexuality in the child are passed unnoticed by the adults of his environment. Only when there is some striking pathological deviation from this normal evolution of sex life, such as unusual or shameless masturbation, excessively intense affection, extreme cruelty, is any cognizance taken by parents of events which are occurring daily under their eyes.

Even in the following case, the parents were somewhat

loath to view the symptoms as having a sexual import: A beautiful, physically perfect, precocious 5-year-old girl was brought to me for "nervousness" which finally focused down into three definite symptoms, namely, an incorrigible desire to kiss her father's bald head, an inexplicable impulse to kick her 4-year-old brother, without the slightest provocation on his part, in the buttocks, and an uncontrollable habit of pinching her aunt's arms "till they were black and blue."

Here is a rather obvious example of an exaggeration of the sex components of pleasure gained through inflicting pain (sadistic) (kicking in the buttocks). It alternates with a perverted and perhaps closely associated, but certainly erotic tendency—insatiable kissing of a bald spot. These manifestations had become so striking that the parents could no longer ignore them, though their connection with the love life of the child, notwithstanding the excessive kissing, was not considered.

The pleasure dependent upon the sense of taste might possibly impress one as being among the earliest sensations, inasmuch as milk has a distinctive flavor, but undoubtedly taste is of later development. Thus in suckling the satisfaction of the infant appears to be in no way dependent upon the taste of the food ingested. Quite as much delight is obtained by suckling parts of its own body, as the thumb, the empty breast of the mother, or an extraneous object, such as a pacifier. In other words, such suckling is rather a matter of mucous membrane erotism than of taste or nutrition.

Very probably it is not the sweet taste alone which accounts for the predelection of the child for hard "rock" candies in the form of lemon sticks, "all-day suckers" and "lolly-pops." Undoubtedly a certain satisfaction, independent of the taste, results from the "sucking." At least it is apparent that adults, having emerged from the stage where sucking affords comfort, prefer their candies in forms where mastication rather than sucking is required—the sweet taste being, of course, the same in both forms.

The sense of taste is invoked about the same time as the sense of smell, its close associate. To smell a flower and to taste it seem to be consequent actions for a child. So, too, with the development of the sense of smell comes an interest in the products of defecation, which at an early age may arouse



no disgust. The absorption of such children with their feces may persist for some time, until through discipline or punishment an aversion is induced. Psychically, the development of such an aversion is grossly paralleled by the common method of house-breaking puppies by rubbing their noses in excreta and at the same time whipping them severely.

Another phase of the defecation process is the attention and importance which the child early begins to recognize is attached by his attendants to the act. He soon appreciates that much stress is laid upon a successful evacuation. He is invariably asked about it and praised when he replies favorably. Moreover, it is a means by which he can invariably summon his mother or nurse to his side, thus gaining a certain amount of attention which might not otherwise fall to his lot.

As is well known, many adults show a pathological interest in excrement. One usually learns from retrospective anamnesis, that such persons found much interest in excretory processes in childhood. Often they possessed the idea that the rectum was directly connected with sex relationship and with birth, e. g., through seeing animals in intercourse. Persons who at one time were much concerned with defecation processes, may exhibit a strong compensatory aversion to foods reminiscent to them in appearance of fecal products. Thus one of my patients, a lawyer, with marked history of ano-eroticism, could not eat such foods as tapioca pudding, "Brown Betty" pudding, braised beef or crab flakes with mayonnaise.

If we grant that the psychic life of the very young child is influenced by all the primitive functions of its little body, and accept that these may be pleasurable or painful, it is reasonable to assume that the child will consciously or unconsciously attempt to reproduce that which has given him pleasure and to avoid that which is disagreeable to him.

Most probably the act of birth, during which the infant emerges from its relatively undisturbed, warm, protecting envelopment into the colder air and pronounced confusion of the lying-in room is in itself disagreeable to the new-born. Perhaps if the baby could formulate its sensations at the time, it would wish that "it had never been born."

Frequently during phases of mental depression and dilemma one finds patients giving expression to such wishes and during

critical emotional periods in later life one occasionally learns from neurotic patients of definite fancies of the solace and shelter which return to the mother womb would afford. This latter type of fancy was perfectly conscious in a very intelligent female school teacher of 30 years who was attempting to free herself from a pertinacious attachment (in a social sense) to her mother. When confronted by the conflict which formed the basis of her neurosis (a fear of suicide), she imagined herself as being a part of her mother again—sheltered and protected from her struggle.

Another patient, a youth of 19, suffering from a severe psychoneurosis, but not by any means insane, who long entertained the infantile idea of birth through the nipples ("babies are popped out of the breast"), remarked in his despair, "I'd like to be fastened to my mother, to her breasts—then I'd feel happy. I think that every child should be up against its mother hard—they would then not be so unhappy when the mother died, because they would have been as near to her as they could get."

From primarily instinctive processes are later developed acts of the will. As soon as the child, with its increasing intelligence, couples a physical apperception with an objective which may be obtained therefrom, the first evidences of will appear. The will of the very young child always expresses itself in an act. Before he begins to talk, he makes known his wishes through grasping, crying, struggling, etc. The child shows a will of his own in the very strictest sense of the word. He knows no compromise and vigorously opposes whatever tends to restrict the freedom of action of his little body. Among the earliest expressions of infantile will is that of opposition to the will of his environment which so very soon clashes with his own.

Even during the first year of life a child is compelled to suppress his will to such an extent that it is not surprising that outbursts of anger and defiance should soon appear. Here for the first time the parents come into contact with pedagogical problems and it is evidently no easy matter to choose the correct balance between exaggerated strictness and excessive tenderness both in the early years and in adolescent life. Unlimited indulgence is the attitude as a rule to the first born, and more

especially to an only child, whose every will (that is, wish) is granted and who early becomes the tyrant of the family. On the other hand, harsh and punitive discipline often is meted out to children who are late comers in the family and who sometimes are not entirely welcome where there are already many children. The absence of love toward such children is not without its lasting influence throughout life. Indifference on the part of the family, however, seems far less detrimental to the child, so far as future social adaptability is concerned, than inordinate coddling from his elders.

Pride, or let us call it a desire for independence, is one of the most important stimuli for activity of the will in children. It is a matter of common observation how tirelessly children will repeat such acts as crawling or walking, in order to be admired by their environment. This may be viewed in the light of an exhibitionistic trend—one of the most powerful traits in childhood, and frequently recognized by parents. Thus, when recently visiting a friend in the country, as I came up the walk leading to the house, my attention was suddenly attracted by a jubilant shout and, on looking about, I saw a little blonde-haired girl in overalls furiously turning somersaults. As I paused to gaze the father remarked, "Oh, don't mind that—it's only Mary showing off—she always does that when any stranger comes to the house."

Another source of intellectual activity we may designate as sympathy or possibly love. The child begins to distinguish those persons intimately connected with his care from other persons. Such a recognition finds expression in the smile of the child on seeing the mother's face or his joyful cry on hearing her voice in an adjacent room, and constitutes, of course, an intellectual act. Intellect and emotion are especially closely connected in the child and the earlier the intellectual powers develop, the more intense is the emotional life.

With pleasurable as well as with painful emotions connected with intellectual processes, the effect on the mind is similar. Just as there is an association of impressions of sympathy for the protecting mother or nurse, so too, an association idea of antipathy may be early aroused for a person causing displeasure, as for instance, the physician, who may forcibly depress the tongue in looking at the child's throat. Such an

impression never entirely fades, but is carried on unconsciously—a fact only partially recognized by educators. Thus it is not surprising that one of my very youthful patients could never quite reconcile himself to the idea of my being a doctor. From his early impressions, a doctor meant a big man with a black beard and a hooked nose, and a person of different physical appearance did not qualify to his psychical conception of a medical man.

Recognition association processes are undoubtedly stimulated by curiosity which actuates the child to wish to feel, see, taste, and smell everything—to his resultant pain or pleasure. Among the earliest intellectual processes one may mention imitation, with all the joy attending upon success. Speech (imitation) which is preceded by babbling, is another early intellectual act, though Freud considers both babbling and echolalia as largely auto-erotic manifestations associated with the pleasurable stimuli received from the mouth and tongue muscular movements.

From the preceding sketchy outline of emotional development it is evident that the child is occupied chiefly and unrestrainedly with the gratification of its own desires and necessities, and that it secures most of its enjoyment from the pleasurable physical stimuli received from its own body or bestowed upon it by others. From the point of view of character development this is of paramount importance for it is very common to find this type of auto-erotic emotional make-up persisting through late adult life with the result that such individuals find themselves out of harmony socially with normal persons who have emerged from such a stage through which, of course, each one of us must inevitably pass. The cause for such a mal-adjustment may remain quite unconscious to such a person, but they are aware that there is a character flaw as they compare themselves with other persons. Their love life, however, continues to center in themselves or goes one step further and remains fixed upon some one like themselves—that is, some one of the same sex.

If this be true, it would seem from an educational standpoint that the early encouragement of responsibility for the child in contributing his mite as well as receiving all from the family commonweal is desirable. Furthermore, it is apparent an interruption of the infantile emotional ties between normal



children and their parents at a reasonably early age is bound in the end to react to the advantage of both.

Many of the implications of this paper are well known and have been so for ages. What is new in this tiny phase of Freudian psychology here presented is the conception of early acts in the pain-pleasure sense, their auto-erotic value and their precursory sex significance, and especially the persistent unconscious force in later life of early emotional impressions.

Novelists from the days of Fielding have hinted at the existence of many of these reactions, but perhaps nowhere has the phase of the importance of infantile impressions been better expressed than by James Lane Allen, in his delightful idyll, "The Doctor's Christmas Eve," where he says, "The doctor wanted to be the first to talk with him (his son)—the first to sow the right suggestion. It was one of his sayings that the earliest suggestions rooted in the mind of the child will be the final things to drop from the dying man's brain: what goes in first comes out last."

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IMPERFORATE HYMEN IN A BABY—(Lancet 1916, i, p. 823. H. R. Spencer). A baby girl, aged 11 weeks, was brought to hospital on account of a swelling in the vulva which the mother had first noticed a fortnight previously. On inspection the labia were separated by a cystic swelling of the size of a small marble which became a little more prominent when the infant cried. It was obviously the imperforate hymen. Its most prominent part was seized with mouse-tooth forceps and an elliptical piece was snipped out; about a drachm of mucus escaped from the vagina and the hymen sank back to its normal position. A thin strand of oiled gauze was inserted into the hymeneal opening for a few days. A fortnight after the part had a normal appearance. The mother was instructed to bring the baby to the clinic from time to time in order to make sure that the aperture did not close. The author urges practisers of midwifery to make a routine inspection of the vulva of female babies before the puerperal attendance ceases. If the hymen is found to be imperforate and bulged forwards by secretion, a snip with a pair of scissors will save the patient from a grave risk to her fertility, health, and even life.—*The British Journal of Diseases of Children.*

# OSTEOGENESIS IMPERFECTA (OSTEOPATHYROSIS, FRAGILITAS OSSIUM), WITH REPORT OF TWO CASES \*

BY HAROLD R. MIXSELL, M. D.

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For a long time there has been recognized the fact that brittleness of bones, especially of the long bones, may result from a great variety of causes, namely, cancer, syphilis, scurvy, osteitis, phosphorus poisoning, and trophic neurological conditions. Independent of these conditions a tendency to brittleness of bones was first noted by Lobstein<sup>1</sup> in 1835 and was labelled by him "Osteopathyrosis". This condition he considered as being an idiopathic one, and as one which had no distinct etiological character. For a long time Osteopathyrosis was regarded as being different from the condition known as "Osteogenesis Imperfecta", which was first described by Vrolik<sup>2</sup> in 1849, but subsequent reports of various cases and pathological work done by Stillings,<sup>3</sup> Sumita,<sup>4</sup> and Fuchs,<sup>5</sup> have proved the two conditions similar.

ETIOLOGY—Schwarz and Bass,<sup>6</sup> after reviewing the literature on the subject, have reached the conclusion that *Heredity* is the only important factor in this disease. They point out the fact that Griffiths,<sup>7</sup> collected 67 cases and found distinct evidence of the hereditary character of the disease in 18. Syphilis does not seem to be a factor. In the author's cases the Wassermann reaction was negative and there was no familial history of the disease. Sumita,<sup>4</sup> examined the thyroid gland of several cases and found it normal, thus ruling out a possible thyroid etiology. In the cases reported here there was no history of fragile bones in either of the father or the mother. That environment evidently has nothing to do with the etiology is proved by the fact, pointed out by Schwarz and Bass,<sup>6</sup> that in one instance, one of two twins showed osteopathyrosis at birth and the other did not. Gurlt,<sup>8</sup> has compared the disease to Hemophilia and states that it is transmitted to males through unaffected females.

PATHOLOGY—In Osteogenesis Imperfecta, as Lovett and Nichols<sup>9</sup> have pointed out, both the trabeculae and the dense cortical or periosteal bone are abnormal. Thus, while in normal ossification the trabeculae are formed chiefly by means of the

\*From the Babies' Hospital Dispensary.

apposition of bone by osteoblasts upon a persisting cartilaginous matrix, in Osteogenesis the new trabeculae are formed by the direct metaplasia of persisting cartilaginous cells into bone; also the lamination of the trabeculae is either absent, or is far less perfect than in normal bone. As for the cortical bone, there is produced by the periosteum, in place of the continuous layer of normal bone, separate plates of non-laminated or imperfectly laminated dense bone, in which oval bone cells are imbedded. *But the Haversian Systems of Bone*—these stress-resisting bony rods that knit together the dense outer portion of the shaft of the long bones—are *absent*. Instead of the Haversian Canals there are long narrow spaces with a resulting condition of osteoporosis. Microscopically the bones may show fractures. The cortex is extremely thin and the diathesis may consist of a firm membranous periosteum filled with a vascular reddish-brown mass. The bones of the cranium are characteristic and form the so-called "Calvaria Membranacea." Hess,<sup>10</sup> compares the cranial vault to a soft rubber sac with mosaic-like inlays of small pieces of bone around the centers of ossification. The fontanelles are widely open and are unusually large. The base of the skull, however, is ossified but is very thin, and may be so brittle as to be easily fractured. The ribs are ossified but may show nodules which represent previous fractures.

**METABOLISM**—Schwartz and Bass,<sup>9</sup> found that the nitrogen metabolism was approximately normal. The fat retention and resorption was perfectly normal, while calcium retention was only slightly below the normal, there being, however, a positive calcium balance. Magnesium retention was 51% and the phosphorus metabolism was practically normal. Bookman,<sup>11</sup> came to the following conclusions in regard to calcium metabolism: 1—In active cases the calcium retention is somewhat below or decidedly below the normal. 2—It is probable that variations in the course of the disease cause changes in the calcium balance. 3—The deficient retention of calcium is influenced favorably by cod liver oil and phosphorus, and still more strongly by calcium lactate.

**SYMPTOMS**—The majority of these children are small and under weight. They are mentally under-developed, their skin is soft and delicate, and their hair is long and silky. Sweating

is rather common and may be profuse and lasting. The head is large in comparison to the chest, the features are small and well-developed, the palpebral fissure is narrow and the tongue is not enlarged. The physiognomy, therefore, is not characteristic, with the exception of the soft and boggy cranium mentioned before. The neck is short, the thorax may be asymmetric, and there may be nodular calluses on the ribs. The abdomen is protuberant and in some cases there may be an umbilical hernia. The extremities are usually curved and shortened and all kinds of deformity from fractures may occur. Some of these cases present such an extreme fragility of the bone that the slightest manipulation causes new fractures; others have evidently passed through this stage *in utero* and only present evidences of deformity and malnutrition. These fractures seem to cause little pain and the bone unites rapidly. They are the most characteristic symptom of the disease, as many as 113 having been found by Chaussier<sup>12</sup> in one case.

**PROGNOSIS**—As a rule the prognosis is bad, the child being either still-born or dying a short time after birth. In those surviving, the fractures may become less frequent with advancing years and the disease may be arrested. Those cases, however, are very susceptible to secondary infections and usually die of some intercurrent disease.

**DIAGNOSIS**—The Roentgen-Ray findings are characteristic and diagnostic for the disease. They may be summed up as follows:

1—Multiple, mostly introperiosteal fractures, often showing areas of bone resorption at the seat of fracture.

2—Excessive callous formation.

3—Deficient shadow formation seen in all bones of the body, due to increased permeability to the Roentgen-Ray. Often the bone shadows show but little more density than the surrounding soft parts.

4—The diaphysis of long bones may be slender, and only very rarely show any curvature or bending.

5—The cortex is of irregular thickness, on the whole very thin and parchment-like in appearance, and may even appear to be absent in some places. There is little or no tendency towards thickening on the concave side of the shaft.



6—The spongiosa contains wide meshes and an absence of structural markings. These changes are not limited to the diaphysis. All bones show this change, but not to the same degree, the most marked changes being found in the bones of the hand.

7—The medullary cavity is increased in size and shows an irregularly mottled shadow.

8—The epiphyseal cartilages and their centers of ossification are larger than normal, and the epiphyseal lines are straight. Hess.<sup>10</sup>

TREATMENT—Cod liver oil, phosphorus, and calcium lactate always should be tried. In the author's cases a marked improvement in the formation of bones was observed during the course of 6 months. In addition to medication, fresh fruits, vegetables (green), fresh air, and sunshine were pushed to the limit, and precautions were taken to prevent further fractures. The following formula was found to be of value:

Phosphori .....	30 minims
Olie Morrhuæ .....	4 ounces

One teaspoon t. i. d. P. C.

The following cases came under my observation at the Babies' Hospital Dispensary:

CASE NO. 1—Mabel Vogelsang. Age 8 months. Only child. No miscarriages. Family history negative for syphilis, tuberculosis and rheumatism. Both father and mother are negative for any broken bones. Full-term baby. Easy labor, non-instrumental. Birth weight 6½ pounds.

Nursed up to the present every 2½ hours for 9-10 times a day.

*Past History*—At birth, baby was born with both femora broken. At 11 days the right arm broke spontaneously with no pain and no history of trauma. At 1 month the left femur broke again spontaneously while child was lying in her carriage. There were no further fractures until the child was 7½ months old, when the right femur fractured again painlessly. The child was then brought to the Babies' Hospital Dispensary after having the femur put up in a plaster splint at the New York Orthopedic Hospital.

*Physical Examination*—Child is marantic in appearance,

looking chronically ill. There is no dyspnea, cyanosis or jaundice. Child appears bright, sits up but falls over readily and back is kyphotic.

Head—measurement 17 inches. Fontanelles are widely open, the entire skull being tabetic and feeling like a rubber bag. Here and there are isolated areas of bone in the process of formation.

No teeth. Pupils are equal and react. No strabismus or nystagmus. *Sclerotics are very blue in color.*



FIG. 1—Showing fracture of left femur. The thigh is enclosed in a plaster of Paris splint. (Mabel Vogelsang).

Nose negative and mouth and tongue are normal.

Neck—short but shows no rigidity.

Thorax—pigeon-breasted and marked beading of ribs. Measurement  $15\frac{1}{2}$  inches.

Abdomen—scaphoid. Both liver and spleen are palpable. Measurement 16 inches.

Extremities—no spasticities.

Bones—distinct bony callouses about the middle of both femora and right arm; there is no motion in the parts and

union has been good. There is little deformity and evidently no shortening.

Child held up head at 4 months, sat up at 7 months.

Wassermann reaction is negative. Von Pirquet reaction also negative.

Blood—Hemoglobin 60%, white blood cells 11,000; red blood cells 4,400,000, polynuclears 20%, large lymphocytes 15%, small lymphocytes 65%.

On admission the child weighed 10 pounds and 12 ounces. It was immediately put on half breast and half bottle of a whole milk formula diluted one-half. In addition the juice of  $\frac{1}{2}$  an orange and a tablespoonful of beef juice was given. The formula mentioned before of cod liver oil and phosphorus was given three times a day. The formula of milk was gradually increased to whole milk, the child being weaned in 12 weeks. Following treatment the weight was 15 pounds and 6 ounces which was an average gain of over 6 ounces a week. There have been no further fractures. The child's appearance is much improved and the Calvaria Membranacea has practically filled in, the fontanelle only admitting two fingers. This case, in the author's opinion, is a true case of early or congenital fragility of bones (*osteogenesis imperfecta congenita*).

CASE No. 2—Bennie Weinberg. Age 1 year. Brought in to Babies' Hospital Dispensary for "lumps in arms and legs."

*Family History*—negative for syphilis, tuberculosis and rheumatism. No history of broken bones in either parents. Three other children, all healthy.

Full term, normal easy delivery. Normal child at birth. Never nursed. Was fed 2 months on a bottle formula composed of milk, barley water and a little sugar, as much as he wanted whenever he cried. For the following 4 months he was boarded out, food unknown. For the past 6 months he has received whole milk, eggs, soup, farina and potatoes.

*Previous History* is negative. Cut first tooth at 7 months, held up head at 4 months, sat up at 10 months and stood up at 11 months by supporting himself.

*Present History*—Child fell three weeks ago. Since then mother has noticed lumps in arms and legs. Child didn't cry, there was no pain, no fever or vomiting.

*Physical Examination*—on admission: Child is very emaciated and looks chronically ill. No dyspnea, cyanosis or jaundice. Appears bright and reaches for objects. Sits up, but back is curved. Falls over easily and cannot stand up alone.



FIG. 2—Showing fracture of radius and ulna of both forearms and fracture of right clavicle. (Bennie Weinberg.)

Head is 17 inches, abdomen is  $15\frac{3}{4}$  inches, chest is  $13\frac{1}{2}$  inches and length is  $27\frac{1}{2}$  inches.

Pupils are equal and react to light. No nystagmus or strabismus.

Nose negative, 6 teeth, tongue clear and not protuberant.

Neck—no rigidity.

Thorax—pigeon breasted. Heart and lungs negative. Moderate beading of ribs.

Head—Hair is sparse and dry. Fontanelles and sutures are closed. No craniotabes.



Abdomen—scaphoid. Liver fell 2 inches below costal margin.

Extremities—no spasticities.



FIG. 3—Showing fracture of right femur with excessive callus formation. The right femur is shorter than the left by a difference of 2 inches. The left tibia shows fractures in 2 places, the one lower in the shaft evidently being of earlier date. (Bennie Weinberg).

Wassermann and Von Pirquet reactions are negative. Blood—Hemoglobin 45%, white blood cells, 12,000, red blood cells 4,000,000; polynuclears 25%, large lymphocytes 20%, small lymphocytes 55%.

Bones—Both forearms are deformed. In the middle of each forearm is what appears to be an old fracture in which both

bones are involved. The lower ends of the upper fragment are posterior to the lower fragment giving a "silver-fork deformity." The left forearm is more involved than the right, and although there is considerable callus formation it may be manipulated slightly. There is no interference with function. In the middle of each clavicle there is a mass of callus. In the left thigh and right leg there is marked callus formation, but no shortening and apparently but little deformity.

This case is evidently a late condition of fragilitas ossium (osteogenesis imperfecta tarda). The treatment has been practically the same as in the case preceding and the child is doing well.

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PREDISPOSING FACTORS IN POLIOMYELITIS (New York Med. Journ., 1916, civ, p. 202. M. Talmey). Pettenkofer held that for every infectious disease predisposing factors were a sure *sine qua non*, thus putting the organism into a place of minor importance. The predisposing factors of poliomyelitis are numerous, otherwise it would not be ubiquitous. One factor Talmey considers is tonsillectomy; this may act in two ways, first, the trauma, with its effect on mind and body, leaving the nervous system in a condition of weakened resistance. The second way is the removal of a valuable protective substance, the nature of which is as yet unknown, which may act in the manner of ferments. So the tonsil may have the same relation to poliomyelitis as the thyroid to myxoedema and other diseases. The writer suggests further investigation on these lines.—*The British Journal of Diseases of Children*.

## THE SIGNIFICANCE OF CERTAIN DENTAL STIGMATA OF CONGENITAL SYPHILIS

BY JOSEPH S. WALL, M.D.

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The aphorism "Do not look a gift horse in the mouth" not only represents a psychological detail in the complex of human inquisitiveness, but quite justly clothes the equine teeth with a diagnostic significance of enduring fame.

The human teeth in no less degree possess a testimonial capacity relating to age, inherited and acquired disease, and the symbolism of tooth pathology is coming into its own in recent years, more, however, from the standpoint of a cause than from that of the effect of disease.

It should be patent that diseases affecting structurally the teeth would leave more or less indelible marks upon these tissues, possessing, as they do, a degree of density and permanency rarely attained by other bodily structures. It is to this particular rôle that we would direct brief attention.

It is equally true that such indubitable marks of systemic diseases do appear in later years as evidences of a prior infection which may itself have passed into a degree of latency such as to escape notice.

Not infrequently the routine examination of the teeth instantly calls attention to the presence of syphilis in the child. Such an observation, while purely clinical, has its merits.

It is to be hoped that the rapid strides which have been made in laboratory diagnosis will not relegate to a minor position the importance of clinical estimation nor dull the acumen of diagnostic exploration. The tendency of modern times seems to be toward diagnosis based solely upon deductions made from the multi-colored slips returned from the laboratory. Without belittling the tremendous importance of our laboratory aids, especially the Wasserman test in the disease in question, it must be remembered that clinical observation usually precedes and directs laboratory examinations, indicating the particular lines of emphasis for chemical and microscopical exploration, and suggests, in routine practice, when and what laboratory aids are to be invoked

in all but that lesser group of individuals who enjoy the systematic research granted by hospitalization and "group practice."

More particularly does this apply to rural practice and to communities possessing limited hospital facilities.

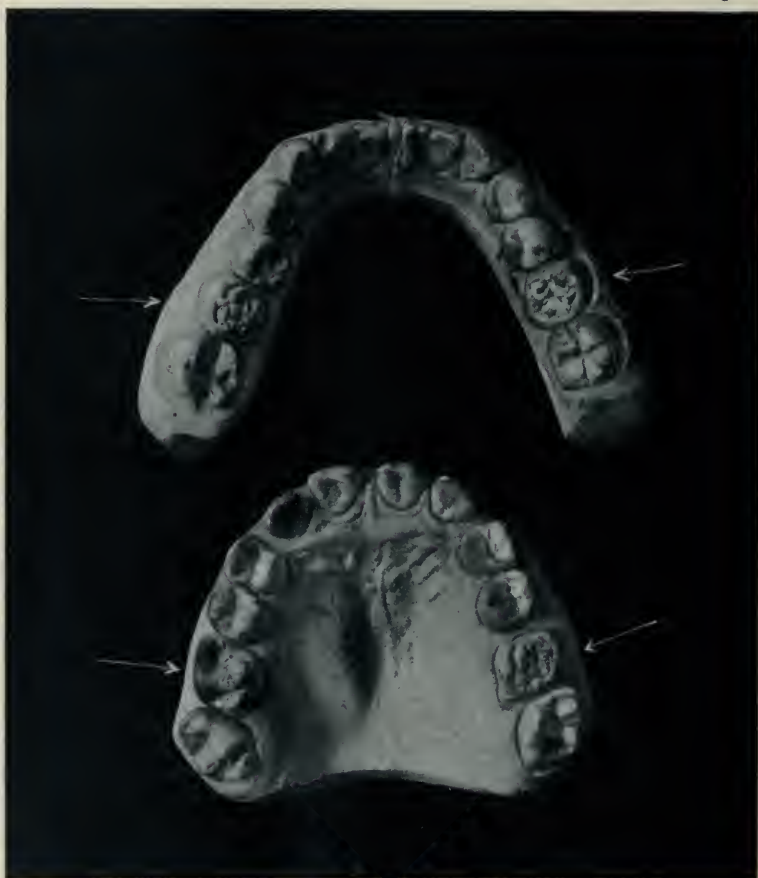


FIG. 1.—Syphilitic Sixth Year Molar in Childhood.

Stigmata of inherited syphilis evidenced by abnormalities of the permanent teeth are sufficiently important to deserve more attention than has been accorded them by medical writers. The dental literature contains more references to this subject and especially to be commended to those interested is the comprehen-



sive exposition of the whole matter by Cavallero, appearing in the *Dental Cosmos* of 1908, page 1,167.

The virus of syphilis affecting the fetus or infant in the early months of life finds a habitat sufficiently pliable to afford a fertile field for destructive tissue changes and for equally deleterious inhibitory effects upon the tender formative structures within the alveolar processes of the newborn and the unborn.

If the luetic poison has been in the ascendancy during certain stages of development of the permanent teeth, especially that of dentinification, the child in later years will present various stigmata which were first pointedly brought to attention by Hutchinson in 1858. The lesions he described in the central incisors now bear his patronym.

Unfortunately, it is probable that an impression has been created that these teeth alone display the stigmata of inherited syphilis, while, on the contrary, there are other teeth just as typical, although less conspicuous, which equally possess characteristic lesions of an antecedent visitation of the taint of this disease. We refer especially to the first permanent molar, commonly called the "sixth year molar."

This tooth, placed relatively far back in the jaw and consequently obscured from casual view, in our personal experience invariably presents typical deviations from the normal if the subject possesses dental stigmata at all.

In our opinion, these molars may even possess greater significance during childhood than the accompanying incisors, as the latter are not infrequently broken and injured by the traumatism of falls and accidents to which the young are especially prone.

On the other hand, it must be admitted that as the child grows older, this relative diagnostic importance is frequently lost because of the encroachment of dental decay which much more rapidly disintegrates the posterior teeth. (See Figure 2.) Even here, however, the tell-tale fillings inserted by the dentist not infrequently form the four corners of a picture in the foreground of which may appear the incisors of Hutchinson.

Cavallero remarks (*loc. cit.*): "The dental stigmata are far from being restricted to Hutchinson's teeth. We must look for them in the whole dental system, in different forms, in arrangements, alterations, and even in the absence of some of the dental units."

According to the French school, especially Fournier, the dental stigmata pathognomonic of hereditary syphilis are the following: (1) Hutchinson's teeth; (2) cuspal erosions of the first permanent molar; (3) multiple and systematic dystrophies of the permanent teeth.

These systematic, and at the same time symmetrical alterations are dependent upon a general pathological process of considerable duration, which produces an arrest of development of the dental follicles during intra-uterine life (sixth month and upwards) resulting in the changes in the first molars; or, during extra-uterine life (just after birth), producing Hutchinson's teeth, and the atrophy of the canines.

If the molars are developing *at the time of specific infection*, they will show traces of this disturbance; if the incisors are developing at the time, we shall see later Hutchinson's teeth; if the canines, we shall there find the dental stigmata.

One might question why these specific teeth named so frequently bear the brunt of syphilitic change, but an analysis of luetic infection of the mother will in large part explain this selective action.

Lues, in the pregnant mother, of sufficient virulence, will produce abortion and loss of the fetus during the first 3 or 4 months and it is during this period that dentinification of the first or temporary set of teeth is taking place; hence they either escape the deleterious influence of the disease, if of feeble virulence, or, the fetus is lost through the influence of a greater blight of infection. It is probable that luetic infection contracted during pregnancy, or existing during that period, exerts its most harmful influence upon the child in the latter half of term or in the first 3 or 4 months after delivery. This period, early post-natal, is, as we well know, apt to be the one demonstrating to us most of the florid lesions of congenital lues. After a time, as we have all experienced in our history taking, these marked effects of luetic transmission may fade and abate, irrespective of treatment.

The chronological bearing of these points on the dental stigmata under consideration is much as follows:

The temporary teeth, calcifying during the early months, are either unaffected, or, the death of the fetus takes place from abortion.

The sixth year molar is the *only* member of the permanent set to dentinify during intra-uterine life. This process usually begins about the fifth or sixth month and is taking place coincidently with the high wave of syphilitic disease in the mother.



FIG. 2—Syphilitic Sixth Year Molar in Childhood.  
(Showing evidences of ordinary decay.)

All of the other permanent teeth calcify after birth, but there are 2 groups which pass through this process in the first few months after delivery, namely, the incisors and the canines, which will carry the tell-tale evidences of hereditary poison if such poison reaches its florid expression at this particular period of infantile life.

Let it be remarked that this poison is none other than the *trepone* *pallidum* which was first demonstrated by Pasini in 1907 in the dental sacs of a seven-months' fetus, findings which were later also confirmed by Cavallero.

The changes in the sixth year molar, which may be the only dental deformities noted in some instances, are sufficiently characteristic to present no diagnostic difficulties. There is an erosion, not the erosion of wear only, but a disintegration of the grinding surface, to which this term is applied in the absence of a better one. This erosion is irregular in form, the surface of the molar for a third or a half or even the whole of its surface is pitted, excavated and discolored. There is often a pulpy looking mass of a dirty yellow color occupying most of the face of the crown, margined, as it were, by the line of cusps ordinarily found on the molar teeth. The tooth has been called the "honey-combed molar of hereditary syphilis." We have spoken of it in our clinics as the "mulberry molar," likening the worm-eaten center of the cutting surface to the appearance of the tip of a mulberry.

The accompanying reproductions of casts of syphilitic teeth show some of the characteristics of this interesting tooth, but only in the living subject can it be seen with all of its decided attributes.

We have not attempted to describe the changes found in the incisors which are, perhaps, the best known, or at least the most commonly looked for stigmata, nor those changes which can be found in the canines which are neither so constant nor so characteristic as the morphology of the sixth year molar.

Our attempt has been merely to emphasize the great importance of this molar from a diagnostic standpoint, to trace the history of its production, and to accord it a recognition in medical writings which heretofore has either been begrudgingly granted it, or withheld altogether—a fact which anyone may prove by attempting to find a description of this "mulberry tooth" in any of the text-books in common use.

Any clinical clue to the existence of congenital syphilis before the onset of a destructive keratitis, which not rarely is one of the latest manifestations, must be recognized as a sign of considerable importance, and more especially so when it points the way to effective therapeutics.

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## A CASE OF HEMORRHAGIC DISEASE IN THE NEW-BORN TREATED BY INDIRECT TRANSFUSION\*

BY J. H. MASON KNOX, JR., PH.D., M.D.

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On March 6th of this year, I was called by Dr. George W. Dobbin, of this city, to see an infant two days old, D. W. K., because it had that morning vomited a considerable amount of bloody fluid.

The family history is unimportant. The father, aged 47, was living and well. There were 4 children, all well, ages 22, 20, 18 and 15, by a former marriage. The mother, aged 34, was perfectly well. She had had 1 miscarriage shortly after her marriage 12 years before, and has 2 children, aged 10 years and 4½ years, respectively. She was threatened with a miscarriage when about 3 months pregnant with this baby, but after treatment, had gone through a perfectly normal pregnancy.

The birth was spontaneous, in fact occurred a few minutes before Dr. Dobbin arrived. The child weighed 7 lbs., 6 oz. The baby was put to breast after 10 hours and then at 3-hour intervals. The mother's milk came after 24 hours. Two meconium stools passed the first day and 2 the second day of the baby's life. On the third day, the baby nursed well at 9 A.M. and shortly afterward vomited a considerable amount of dark blood-stained fluid. There was no fever and no cough.

When seen shortly afterwards, baby was found to be rather sallow, but vigorous; crying lustily. The eyes were bright, and heart sounds clear and regular. The pulse rate was 140 to the minute. The lungs were well filled. The abdomen was not tender and there was nothing whatever abnormal made out. No blood was noticed from mouth or from cord.

During examination, the child passed from 3 to 5 ounces of tarry, blood-stained material, evidently a hemorrhage from the intestinal tract. There was no lesion about the anus. It was at once concluded that this was a case of melena, and transfusion from the mother was determined upon.

This was performed by Dr. Kenneth Maxey of the Johns Hopkins Hospital. About 50 c.c. of mother's blood was received into 60 c.c. of sodium citrate solution. With a syringe, about 15 c.c.

\* Read before the Twenty-ninth Annual Meeting of the American Pediatric Society, held at White Sulphur Springs, W. Va., May 28, 29 and 30, 1917.

of this was introduced in the longitudinal sinus and the rest in small quantities intra-muscularly into the buttocks. From 12 M. to 3:30 A.M., when the transfusion was completed, the child passed three or four tarry stools, and was greatly blanched, pulse became thready and respiration shallow and the baby seemed about to die.

With complete rest, however, the condition slowly improved through the night, and the following morning, the child seemed much better. At midnight she began getting sips of water, which she took eagerly, and at 7 o'clock, 2 drams of mother's milk were given and repeated at 2-hour intervals. The pulse was 126, the respiration quiet and there was no distention. The temperature rose to 102°, which was due almost certainly to external heat. The following day the baby had 1 bloody discharge from the bowel, not accompanied by any change in pulse or rise in temperature. The material was darker than before and was probably part of the original hemorrhage.

The child was hungry and the amount of milk was increased to 6 drams, every 2 hours. The following day the baby had 2 yellow stools with some mucus, and the color was further improved. She was given 1 ounce of milk at 2-hour intervals during the night.

From this time on the child made an uninterrupted recovery, and there was no further bleeding. The mother's milk was pumped out and given to the baby for 2 days, and then the child was put to the breast and allowed to take 2½ to 3 ounces at 3-hour intervals. She gained from this point, regularly. On April 11th, the weight was 8 pounds, hemoglobin 65 per cent., and she was taking 4½ ounces of milk, 5 feedings. On May 24th, the baby's weight was 10½ pounds., her color was good, and she seemed to be a perfectly normal baby.

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HYSTERICAL MUTISM IN A BOY—(Lancet, 1916, i, p. 1,039). A. J. Hall gives the detailed clinical history of a case in a boy, aged 11 years, in whom was illustrated the cumulative effect of repeated psychical shocks, at considerable intervals of time. It is well to bear in mind that the correct diagnosis of these cases, satisfactory as it may be to the medical man, does not always determine their cure. Such cases are most difficult to deal with and are very liable to relapse.—*The British Journal of Diseases of Children*.

## THE THERAPEUTIC USE OF BLOOD SERUM\*

BY ROWLAND GODFREY FREEMAN, M.D.

New York

Somewhat more than a year ago I was called hurriedly to a baby, 2 days old, who had passed, an hour and a half before, at 2:30 P.M., a movement which consisted of  $1\frac{1}{2}$  oz. of clotted blood. Three smaller movements of the same character had previously been passed. The child was pale and its condition critical. The father was fortunately accessible. A needle was passed into one of his veins and 6 oz. of blood removed; 15 c.c. of the blood serum was injected into the baby at 5 P.M. When the child was seen again at 9 P.M. no more blood had been passed and a second injection of 15 c.c. of blood serum was used. A movement the next day contained two small clots of blood, but it was evident from the time the first blood serum was injected that the bleeding had been entirely controlled. This baby went on to a normal development.

There was, of course, nothing unusual in the reaction to blood serum in this case of hemorrhage of the newborn, but it made an impression on me and brought up the question whether this treatment, which worked like magic under this condition, might not be applied to other conditions with good results. Of these conditions the one which we always have with us and in which our results are not too good—marasmus—seemed to present itself as one worthy of any treatment that might give any promise of result.

I had, at this time, in my service at The Roosevelt Hospital, a baby 7 months old (Chart 1), who had come in weighing about  $11\frac{1}{2}$  lbs., and who, although fed on different promising foods, excepting breast milk, continued to lose. One month after admission the baby had lost a pound and as I made rounds I thought from the appearance of the child and the grayish color that he was dead. Investigation showed, however, that he still lived and we gave him a hypodermoclysis of 250 c.c. This was followed by a rise of temperature and an increase of several ounces in weight.

\* Read before the Twenty-ninth Annual Meeting of the American Pediatric Society, held at White Sulphur Springs, W. Va., May 28, 29 and 30, 1917.

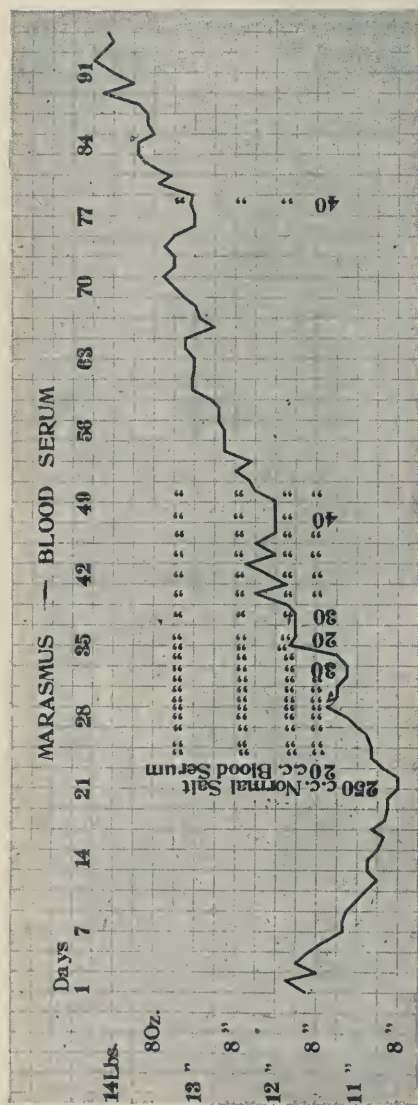


CHART 1.

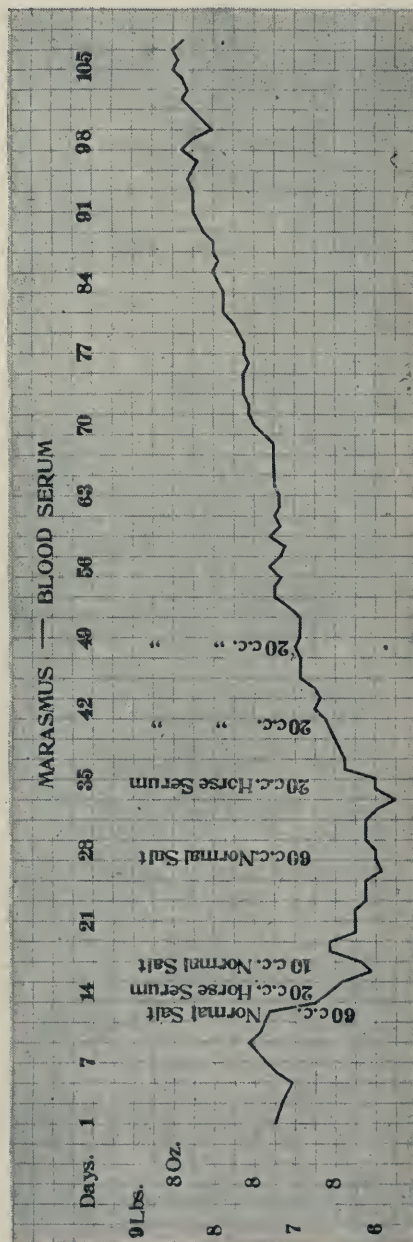


CHART 2.



On the following day 20 c.c. of horse serum were injected. This gave him a temperature reaction up to  $102^{\circ}$ , as it did on the two following days, when he again received injections. The weight, at the same time, increased so that in 6 days he had gained nearly a pound. After that there was less temperature reaction and less rapid gain in weight, but an entirely different appearance in the child. He took his food better, he developed some color and appeared as if there might be some chance of saving him. Seventeen days after the treatment was commenced he had gained nearly  $1\frac{3}{4}$  lbs. and at this time the treatment was given only every second day, but a larger amount of horse serum

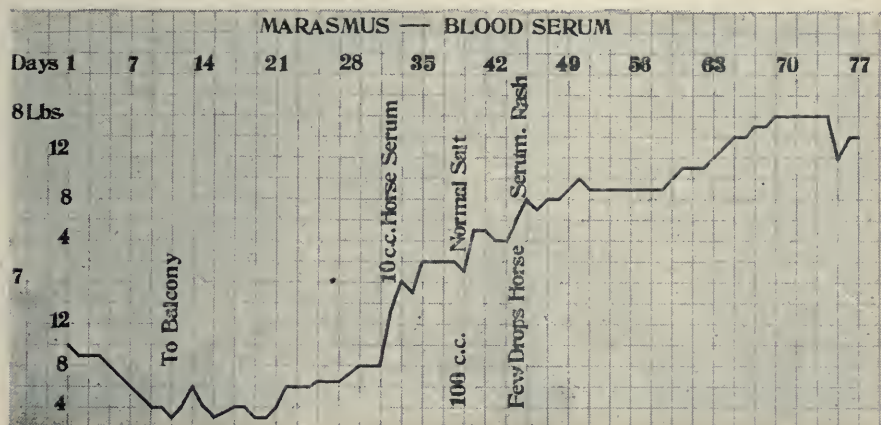


CHART 3.

was used. A little less than a month after the first treatment his condition was so good and his progress so satisfactory that the injections were discontinued while his improvement went on. Only once after this, 6 weeks later, one more injection of 40 c.c. of horse serum was given. This was followed by a gain of 1 lb. in weight in the next 2 weeks. The baby had now gained from the original  $11\frac{1}{2}$  lbs. to 14 lbs., was taking his food well and was sent home cured. This baby we think would certainly have died without this treatment.

A child (Chart 2), on my service at the New York Nursery and Child's Hospital, who came in weighing  $7\frac{1}{4}$  lbs., and then lost rapidly to 6 lbs., 10 oz., was given at that time a normal saline solution and the following day 20 c.c. of horse

serum. He continued to lose for 2 days after this, when he was given another hypodermoclysis. He then gained, but subsequently lost and made no improvement for 3 weeks, when he was given 20 c.c. of horse serum. He began to gain immediately and continued to do so, and when finally discharged his weight had increased nearly 3 lbs. from his lowest weight. This again was a child who, when treatment was undertaken, looked as though he would certainly die.

Recently, in the service at The Roosevelt Hospital, I had at the same time, in the ward, 4 children, all admitted with a weight of 5 or 6 lbs., all about 2 months old, on whom we had labored with different sorts of feedings continuously since their admission.

On the same day treatment was started on all 4 babies.

The first child (Chart 3), was kept in the ward for 2 weeks and lost in that time from 6 lbs., 11 oz. to 6 lbs., 6 oz. She was then put on the balcony for 2 weeks, at the end of which time she weighed 6 lbs., 6½ oz. At the time horse serum was given her weight was 6 lbs., 8 oz. She gained immediately and in a few days reached 7 lbs., 2 oz., when another dose of horse serum was given.

In giving these subsequent injections of horse serum it is necessary to test the child for sensitization, so before giving this child a third injection of a large amount, a drop or two of horse serum was injected and as an urticarial rash developed the child was considered sensitized and no further horse serum was given. She, however, went on to gain fairly satisfactorily until she developed measles and was removed from the hospital.

The second child, (Chart 4), came in with a weight of 5 lbs. 12 oz., and lost at first and finally ran along about 6 lbs., 6 oz. She was given first a normal saline hypodermoclysis with no effect on the weight. This was followed by an injection of 20 c.c. of horse serum and the child began to gain. This gain continued, so that when she left the hospital, some 2 months later, her weight had increased about 2 lbs.

A third child, (Chart 5), came into the service with a weight of 5 lbs., 15 oz., lost to 5 lbs., 9 oz., and when weighing 5 lbs., 11 oz. was transferred to the balcony. She gained a little, but again lost, so that after 5 weeks her weight was only 5 lbs., 14 oz. She was then given 80 c.c. of normal salt solution and gained to 6 lbs., 4 oz., when 20 c.c. of horse serum was given, followed by

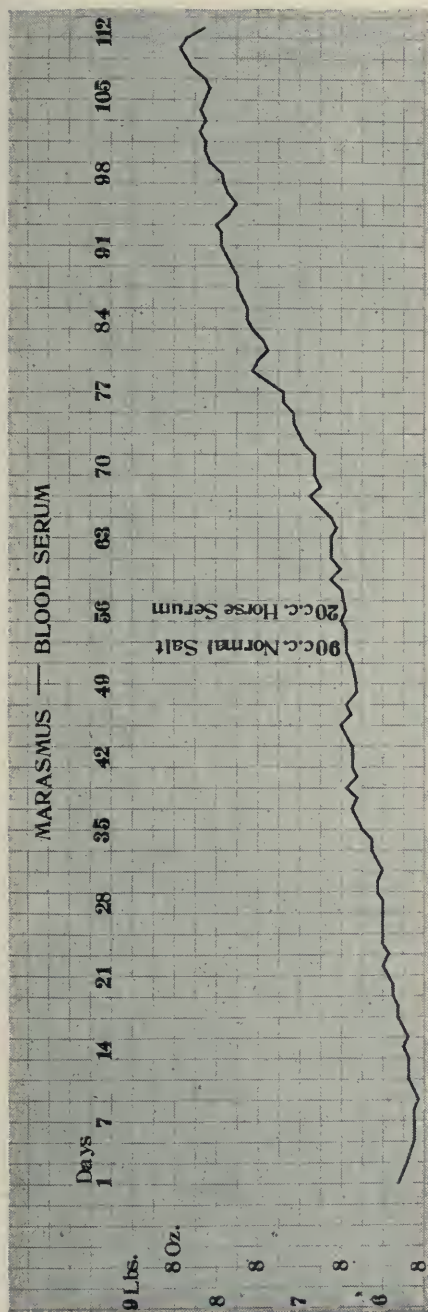


CHART 4.

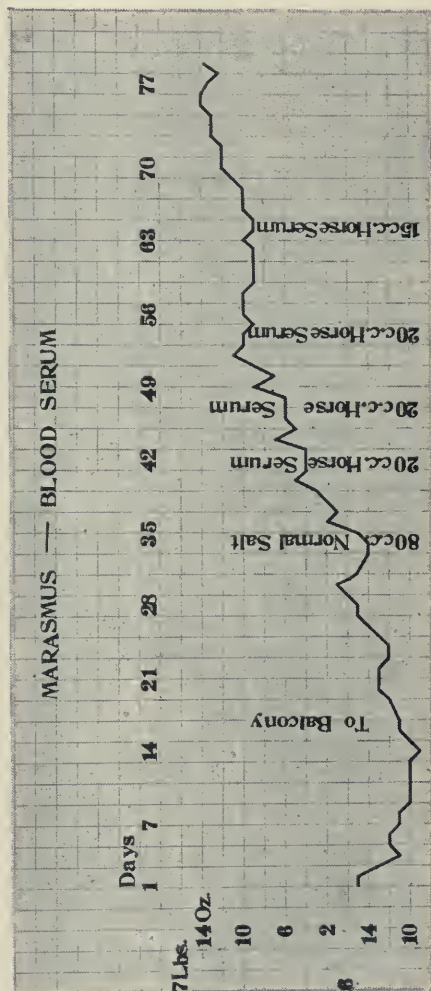


CHART 5.



other injections, so that when she left the hospital with measles her weight was 6 lbs., 13 oz.

The fourth case, (Chart 6), came into the hospital weighing 6 lbs. He lost and gained, and weighed 6 lbs., 2 oz. when an injection of 10 c.c. of horse serum was given. No gain in weight followed, and a normal salt solution was injected and after this another dose of horse serum—20 c.c. This was followed by a gradual gain in weight. After 10 days the child was again losing and more serum was given and 4 days later he was removed to the balcony. A rapid gain in weight ensued, so that when he left the hospital with measles his weight was 7 lbs., 9 oz.

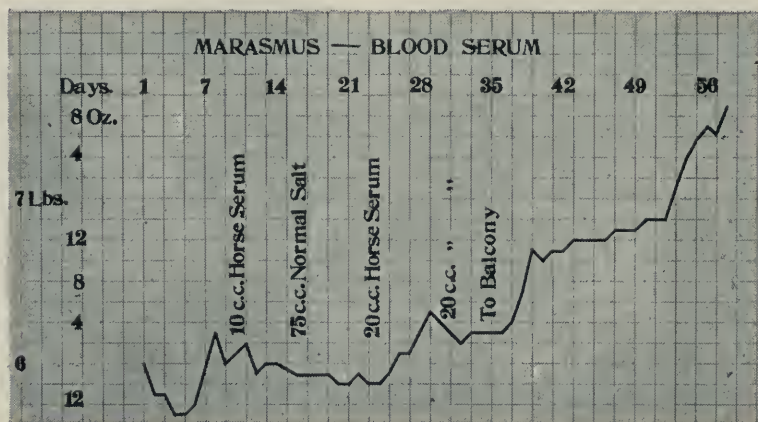


CHART 6.

The good results of this treatment, while being evident from the gain of weight, were also accompanied in the successful cases by a general improvement in the behavior of the child. The child would have a better color, a better appetite, and present altogether a more favorable appearance.

In one case of miliary tuberculosis (Chart 7), with consolidation and cavity, which lost at the hospital from 26 lbs. to 18½ lbs., and under fresh air and heliotherapy gradually gained to 26 lbs., at which weight for weeks she had remained stationary; 20 c.c. of horse serum, repeated once, apparently started her gaining again, so that a month later she weighed 27¾ lbs.

One other case may be worth while reviewing. (Chart 8.) A child 9 months old, the feebler and paler one of twins, weighing



18½ lbs., developed middle ear disease, both ears being opened, with a temperature of 104 4/5°. The temperature gradually

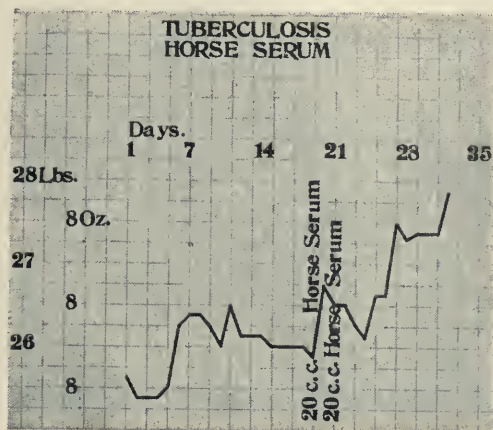


CHART 7.

declined, but 8 days later, with a temperature of 106½°, one mastoid was operated on. Twelve days after this, with the temperature rising daily to 103° or 104°, the other mastoid was operated on. The temperature never went to normal, and 5 days later the child was very sick, with a temperature of 104°.

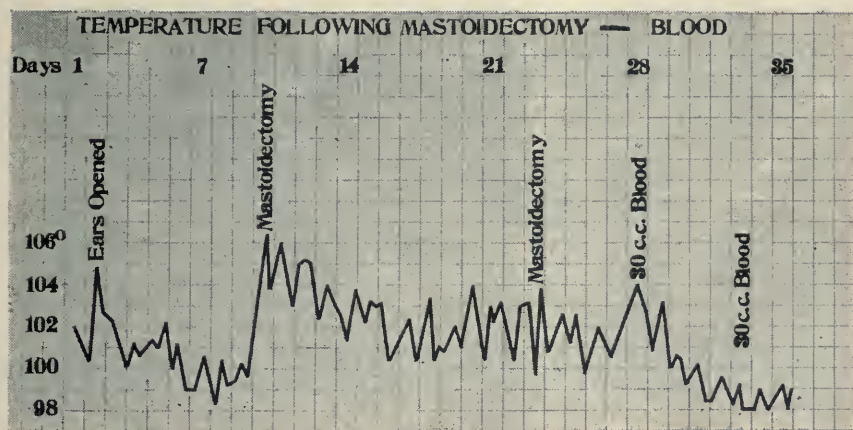


CHART 8.

Transfusion was recommended, and after a dissection of 1 hour no vessel in the arm at the elbow joint was found large

enough to contain a needle. The father, who was waiting as a donor, was then tapped and 30 c.c. of his blood was injected into the child's buttocks. The temperature dropped in 3 days to 100°, and in 5 days to normal, with a marked improvement in the appearance of the child. A week later, although no rise in temperature had occurred, a second injection was given. Since that time this child, who was always of lower weight by a pound or two than the other twin, has developed a better color and is equal in weight to his mate.

The writer has not attempted to describe all the cases in which this treatment has been tried, nor does he hold that this is in any way a panacea. It is, however, if under proper control, a safe procedure and in some almost hopeless cases apparently produces a marked improvement. It has seemed to the writer that it has a much greater sphere of usefulness than has previously been appreciated.

211 West 57th Street.

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INFANTILE TETANY (Dub. Journ. Med. Science, 1916, i, p. 8). Spencer Sheill points out that tetany is an affection more commonly met with in children than in adults, and this is what one might reasonably expect when the instability and lack of development of the infant's nervous system are taken into consideration. After discussing the predisposing and exciting causes the author records the histories of three cases. It is a fairly generally accepted fact that tetany is most commonly associated with rickets, laryngismus, enteritis, or teething. In tetany there is no loss of consciousness, and the spasms give every indication of being painful to the infant as judged by the facial expression and by the scream. Trousseau's sign is usually present—the muscles being in such an irritable condition that pressure over a nerve trunk will throw the corresponding group of muscles into a state of spasm. Tetany has been mistaken for cerebro-spinal meningitis, but in the former cerebral symptoms, fever and vomiting, are absent. Tetany *per se* is seldom fatal. In concluding, the author asks, "Would it not be safer if we dropped the word tetany and classified such cases as a form of convulsion—without loss of consciousness—occurring as the principal symptom of an underlying but often undiagnosed disease?"—*The British Journal of Diseases of Children*.

# INTUSSUSCEPTION, ITS EARLY RECOGNITION \*

BY HARRY APFEL, M.D.

Brooklyn, N. Y.

Instructor in Pediatrics, New York Post-Graduate Medical School  
and Hospital

A glance at the literature on this subject shows that most of the cases reported have been below 1 year of age.

Wollin<sup>1</sup> collected 20 cases in Kaiser Fr. Joseph Spital between 1893 and 1914: 13 of these 20 were under 1 year of age; 4 of these 20 were under 6 months of age; the youngest was only 3 months of age and the oldest 12 years of age; 11 of these were male children, 9 females. The same author says regarding the presence of tumor in these cases: "Das allersicherste symptom, der Wurst förmige Tumor im abdomen fehlte auch nicht in Einem Falle."

Thirty-two cases of intussusception treated in the New York Post-Graduate reported by Dr. Peterson show that ages ranged from 16 days to 13 months; 3 cases in older children. Here also tumor was palpated in every case. (In hospital cases, tumor is invariably present.)

Clubb<sup>2</sup> out of 173 cases found tumor present in all but 2 cases.

Hussey<sup>5</sup> states tumor is felt in 86% of the cases.

Now a word as to the management of those cases cited above, from the literature: Those cases that recovered were operated within 48 hours from the time of onset of symptoms. Cases operated in first 24 hours gave a mortality of 10%. The average mortality was 50%. Note the difference between early and late operation.

Dr. Wallis<sup>3</sup> in London Lancet says: "I have long been of the opinion that methods for reducing the intussusception such as gas, air, etc., should not be attempted and should not be taught to our students." Although in contradistinction, I should cite Kerley's case<sup>4</sup> where he succeeded by means of water pressure to reduce an intussusception that had existed for 6 days. While we should not discredit this successful result there is nevertheless a strong doubt in our minds, whether the case was not some other form of obstruction, for 6 days is quite a while for an

\* Read before the Brooklyn Pediatric Society, February 28, 1917.

intussusception, when one would naturally expect some serious pathological results judging from pictures seen at operation of cases that have only existed 48 hours, to say nothing of 6 days. While tumor is present in the majority, nay in all the cases if you wait long enough, it is a question whether you would wait to diagnose a case as empyema of chest, until you get bulging of the chest, as has been the case when we were talking of empyema necessitatis. To-day we are satisfied with much less exact symptoms to make the diagnosis of fluid in the chest and so here one need not wait for the development of all the classical symptoms, such as tumor and bloody stools, before recommending surgical intervention.

Dr. Francis Huber<sup>6</sup> reports 2 cases in ARCHIVES for 1903, neither of which showed a tumor even as late as 4 days after the onset of first symptoms. One of these 2 cases was only diagnosed after an exploratory laparotomy was done because of absence of the tumor. But vomiting, pain, and constipation was always present. When we consider the mortality in these cases also when we consider what a comparatively simple thing an exploratory laparotomy is to-day with the advance of modern technique in surgery, as well as the progress of anesthesia it behooves us not to dilly-dally with inflation, etc., but refer the case to the surgeon as soon as the case has been diagnosed.

Dr. Lillienthal in discussing a paper on intussusception before the New York Academy in April, 1903, states in part as follows: "The only proper treatment is surgical, for, while occasional recoveries do occur after the use of hydrostatic pressure the latter method (hydrostatic) is of itself quite dangerous.

Dr. S. Keel<sup>7</sup> states repeated attempts at mechanical reduction are not only useless but dangerous and give more time for swelling and edema of the intussusception to occur, for adhesions to form, and perforation and peritonitis to take place, which may change a case from a simple operation and recovery to a complicated case and even ending in death."

Here it would be in place to make a plea for the baby with a suspicious paroxysmal vomiting and pain. We should not be satisfied with one examination alone, but one should observe such a case every hour or two and not simply prescribe and say the customary "let me know to-morrow, how the baby feels." For to-morrow may mean a gangrenous gut; whereas to-day a sim-



ple laparotomy and a quickly reduced intussusception and the most important a low mortality.

It is not so important a factor in the diagnosis whether the majority of patients are male or female, for our case may be in the minority class which would not help us very much. The most important point for us to bear in mind is how soon can we diagnose the case. As long as we are going to teach that tumor sausage shaped or of any other shape is imperative to make a diagnosis of intussusception, just so long will our mortality of these cases run up into the alarming figure of 50%. If we wait long enough our statistics and text-books will be found to be correct, for we will allow sufficient time for the intussusception to swell enough to give us a palpable tumor in every case. But is it not sufficient to know that we are dealing with an obstruction, and if tumor be present or not one or two enemas possibly with a little water for pressure purposes and if not relieved exploratory laparotomy be recommended? We do not see many children die as a result of exploratory laparotomies, but we do admit children to the hospital in a hopeless state for operation after they have been sick for 2, 3, and 4 days, a length of time which no man should permit to go on without operation, even in the absence of tumor, and when tumor be present nothing but operation should be the treatment without much waiting.

CASE—The author was called to see this patient at 6 A.M., January 5, 1917, and the following data was obtained: A little girl 9½ months of age. Three other children, living and well. Mother has had two miscarriages previous to the birth of this baby. This child was of normal delivery, birth weight, 7 pounds. Had been suffering from pertussis for past 6 weeks. Breast fed exclusively up to 2 weeks previous to onset of present complaint. Mother volunteered the statement that the baby received on several occasions eggs, also that several days previous the baby was given some grocery milk (can milk) to which, by the way, she attributed the vomiting. The baby was perfectly well (excepting its cough) up to about eleven o'clock the evening before, when it suddenly commenced to vomit and vomited repeatedly up to about two o'clock the same night. Vomiting stopped after the mother had administered an enema of soap-suds, and the baby fell asleep. About four o'clock the

same morning, baby waked up and cried, when the mother put the baby to the breast and nursed it. The baby soon vomited the nursing and continued to vomit a greenish fluid, which came in paroxysms, another enema being given with no effect. The physical examination showed a baby very poorly nourished and quite pale, very thin musculature. The child would every once in a while become drowsy, fall asleep and soon after wake up with a sharp cry as if in pain, just then her legs would draw up and she would retch or vomit, then the child would relax its legs, close its eyes and go off to sleep again for several minutes, then again the same waking, crying, vomiting, would recur and again the child would become quiet and calm and go to sleep. Head negative, except a little rigidity of neck, not constant, eyes negative, pupils reacted to light quite readily, mouth and throat negative. Tongue coated and dry, heart negative. Lungs, a few râles scattered over the chest posteriorly, abdomen not distended, soft, no tumors palpable, no Kernig's or Babinsky's was present, no paralysis of any limb or any other group of muscles could be made out, temperature 99°F. (rectal), pulse 120, respirations 30. Considering the data found one might have possibly dismissed this case with a diagnosis of acute intestinal intoxication, due probably to the can milk and eggs, which might have been of questionable reputation, but there was the absence of any diarrhea. Although an acute gastritis might give such a symptom complex, the beginning of meningitis or some other acute infectious disease might start with vomiting and prostration and rigidity of neck, but why that crying out as if in pain with each fresh vomiting attack? And also, why the absence of any temperature or rapid pulse? An acute appendicitis had to be considered and could not be easily ruled out. So the author sat down and watched each movement of the child, and in a few moments later another paroxysm of the type described above approached, but this time one could easily discern 2 peristaltic waves, a short one, curved, about 6 inches long, with the convexity upwards and filling the right lower abdominal quadrant. The other one longer but of the same shape, filling the entire right upper abdomen, along a course where you would expect the large intestine. Both of these waves disappeared as soon as the vomiting paroxysm was over. For several minutes all was quiet, child asleep or drowsy, then

another attempt to vomit brought again these peristaltic waves into view. Rectal examination was negative. This picture spoke of some obstruction evidently quite low down and since the majority of intestinal obstructions in children, under 1 year of age, prove to be intussusception, such diagnosis was made in this case and the case was referred to Dr. Delatour in the St. John's Hospital. On admission an enema brought some bloody fluid, the first sign of blood from rectum but not tumor. Dr. Delatour operated within a short time after the child was admitted. On opening the abdomen a little free fluid as well as an ileocecal intussusception of about 12 inches in length was found, which Dr. Delatour reduced. The invaginated part of the gut was quite boggy and a little discolored. Abdomen was soon closed and child made a rapid recovery.

The interesting features about this case. This child was sick only about 9 hours before it was operated upon. I find a case reported in the literature,<sup>8</sup> where the child was operated upon  $4\frac{1}{2}$  hours after onset of first symptom. Considering the early morning hours no time was lost in our case and yet note the pathologic changes that were already present in the tissues involved. A fact which should impress us with the importance time plays in these cases. Time which is very often lost by deferring a diagnosis until tumor develops or time lost needlessly with futile methods trying to reduce the invagination.

*327 Pennsylvania Avenue.*

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## SOCIETY REPORT

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### THE PHILADELPHIA PEDIATRIC SOCIETY

*Stated Meeting Held April 10, 1917*

THE PRESIDENT, JOHN F. SINCLAIR, M.D., IN THE CHAIR

DR. JOHN KOLMER read a paper on "The Non-Specific Activity of Bacterial Vaccines." He said that owing to the weight of laboratory investigations and evidence and the fundamental laws of specificity and immunity reactions, the therapeutic effects following the administration of a bacterial vaccine have been generally ascribed to the production and activity of specific antibodies and any deviation from this current of thought has been generally received with a measure of skepticism and disapproval.

Since 1895, however, occasional laboratory and clinical reports have definitely indicated that a share of the good effects following the administration of a bacterial vaccine may be ascribed to certain non-specific and as yet ill-defined factors, among which the following may be mentioned: (a) Leucocytosis; (b) hyperpyrexia; (c) stimulation of antibody-producing tissues and particularly the hemapoietic organs; (d) mobilization of proteolytic and lipolytic ferments which, according to the investigations of Jobling and his colleagues, may hydrolyze toxic protein molecules into lower and non-toxic forms, and attack the lipoid-protein envelope of bacteria, thereby rendering them more liable to destruction; and (e) increase of the amount of antiferments in the body fluids, which may inhibit the growth of bacteria or prevent them from an elaborating leucocidins, aggressions or other substances used by the bacteria for their protection.

Aside from the good effects occasionally noted in the treatment of certain infections with bacterial vaccine prepared of bacteria having no etiological relationship with the disease, the administration of a bacterial vaccine appears to protect the immunized individual in some degree against other infections; a profound and favorable influence upon metabolism with increased elimination of waste and gain in body weight are occasionally noted and these non-specific efforts tending to improve the general condition may be as important as the production and activity of specific antibodies.



DR. JAY F. SCHAMBERG read a paper on the use of "Bacterial Vaccines in the Treatment of Diseases of the Skin." He stated that with the introduction of new therapeutic measures in medicine there was a tendency on the part of some practitioners to excessive enthusiasm and extravagant claims, while the group of conservatives remained skeptical to the point of incredulity. Scientific conservatism in medicine was a desirable quality, provided it was not carried to extremes. Vaccines have been used extensively in diseases of the skin, but no positive and definite measure of their value has yet been determined. In furunculosis vaccines exhibit their most constant and definite beneficial value, but they are not to be used to the exclusion of other methods of treatment, inasmuch as the foci of infection whether in the teeth, tonsils or elsewhere must be eliminated. Formerly one depended on hygiene, proper food and tonics to increase the defensive powers for the individual against pus infection. Vaccines specifically strengthen the staphyloopsonins and thus lessen vulnerability to infection. In carbuncles good results were likewise obtained although not as constantly as in the case of boils. There are forms of pustular dermatitis which were favorably influenced by the use of vaccines.

Dr. Schamberg exhibited 2 photographs illustrating a very remarkable result obtained with the use of autogenous vaccine in a case of sycosis of 5 months' standing that had resisted all methods of treatment. Two injections sufficed to produce a cure and the patient's opsonic index was raised from 0.6 to 0.1. In 18 days the condition was completely cured and remained so permanently. The patient immediately began to take on weight and gained about 40 pounds in 2 months. Another case of sycosis treated at the same time also showed improvement almost to the extent of cure. In a number of other cases, the results were much less favorable. Dr. Schamberg called attention to the fact that in the 2 cases referred to there had been infiltration at the site of injection in 1 case, and the formation of an abscess in the other case which he believed to be due to incomplete sterilization of the vaccine.

In acne Dr. Schamberg used a vaccine composed of a stock acne bacillus with the addition of autogenous cultures of the staphylococcus or of the colon bacillus. This selection of

organisms was based upon complement fixation studies which had been carried out on acne patients by Drs. Strickler, Kolmer and Schamberg. They had found that with the acne bacillus as an antigen, positive complement fixations were obtained in 84% of acne patients. With the staphylococcus 64% of positives were obtained and with the colon bacillus 63%. The most logical vaccine would be one which was made up according to the individual complement fixation tests. The use of the ultra-violet rays, by inducing hyperemia of the skin of the face, aids in bringing opsonin laden blood to the area of infection. Dr. Schamberg had found acne stock vaccines to give disappointing results.

The use of tuberculin in lupus vulgaris and in other tuberculous skin infections, had in general given disappointing results, although in certain cases of scrofuloderma striking improvement was exceptionally obtained.

In conclusion, Dr. Schamberg said that he had had far more failures than successes with vaccines in the treatment of skin diseases, but that occasional brilliant results encouraged him to use this method of treatment.

DR. M. H. FUSSELL read a paper on the "Use and Limitations of Vaccines in General Medicine." Dr. Fussell said that the value of vaccines in human medicine is perhaps beyond estimation. The harm that they have done is also a prominent feature in human medicine, not so much the harm they have done in any given case, or in any given series of cases, but because physicians are always ready and anxious to do what they can for their suffering patients.

It is the lack of accurate application of vaccine therapy which seems to me is the harmful part of vaccine treatment in human medicine. The facts which must be borne in the mind of every practicing physician in regard to vaccine therapy, are these:

- 1—That vaccines are absolutely specific, that is, that a vaccine made from the bodies of a diphtheria bacillus are absolutely of no value in a disease caused by a streptococcus.

- 2—As a good working basis, the vaccine should be made from organisms obtained from the patient, that is, they should be autogenous vaccines.

3—Every patient who receives vaccine treatment should always have used the ordinary treatment which is considered proper for the condition.

The most useful application of vaccine in human medicine is in prophylaxis. Too much carelessness exists at the present time, both as to the manner of vaccination, and as to the care of the patient after he has been vaccinated. During the past year the writer has seen 3 cases of tetanus following vaccination, each one preventable, because they came from contamination of the vaccinated area after the patient had been vaccinated.

Next in value to the vaccination against smallpox, comes the vaccination against typhoid fever. On general principles the use of vaccines in such a disease as typhoid fever is contraindicated, and it seems to me that as yet their use is not to be recommended. In a disease like typhoid fever where the mortality rates differ so much in various series of cases, it is not entirely impossible to come to a positive conclusion as to the effect of this or that treatment, and enough cases have not been recorded to make the statistics of much value. It also seems to me that in such a disease as typhoid fever, where the patient needs all his defensive powers in order that he may not succumb to the disease, the use of such vaccines in the treatment of typhoid fever may be easily detrimental; reactions may be brought about by which the patient's resistance may be broken, and what may be otherwise a favorable case, may indeed be converted into a fatal one.

In a disease like rabies, where the mortality of the disease is about 100%, anything which offers relief from this disease is a boom. Pasteur's vaccination against rabies has lowered the incidence of the disease to a very marked degree.

All observers are agreed that the use of vaccines in human medicine as a prophylactic is of the utmost value, and there is a consensus of opinions that in the therapeutic use of these preparations harm can be done, not only to the individual treated, but to moral physicians, who use a method which is potent occasionally, but which is very frequently not only harmful, but leads to haphazard methods of treatment. In 1912, in the *Journal of the American Medical Association*, Theobald Smith has this to say of vaccine treatment: "From one of the most delicate prob-

lems, the injection of vaccines is being brought to the level of a patent medicine cure-all. Even with the greatest care in administration there is still plenty of empiricism bound up with the use of vaccines, as long as our knowledge of immunizing and toxic qualities remains incomplete. The over-burdened physician is ready to substitute some other responsibility and authority for his own, and commercial interests are much too ready to assume it. It is invariably the rule in the proper treatment of any diseased condition to search for the cause, and if possible remove it. Then treat the residual condition, if there be any, in such a manner as seems proper. The theory and practice of vaccination in infectious diseases is best carried out by making a culture from the site of the infection, and then having a vaccine made from that culture. This can be done where a laboratory is accessible, and always should be done where it is at all possible. In that way one is sure of at least using an organism which is at the seat of the lesion. However, every autogenous vaccine is not of necessity a specific. For instance, a vaccine made from the nose is not of necessity a specific against infectious rhinitis.

Tuberculin in the hands of the general practitioner may do harm to his patients rather than good. If it is desired to treat a tuberculous patient with tuberculin, he had better be put in the hands of one skilled in such work. There are certain useful applications for vaccines, however, in general medicine, among these, applications in skin diseases, described by Dr. Schamberg; in certain cases of middle ear diseases, a properly prepared autogenous vaccine occasionally gives good results but nothing has to be more scientific, and likely to lead to unfortunate failure than the indiscriminate use of Stock Mixed Vaccines in these cases of middle ear disease.

It seems to the writer that the treatment of infectious colds with certain stock vaccines, comes under dangerous and futile medications.

To conclude then: Autogenous vaccines in human medicine is practically prophylactic. There is curative value in certain conditions like skin diseases and ear diseases and local suppuration and in some chronic conditions. It must never be forgotten that a vaccine to be of any value, or as a therapeutic agent, must



be made of the same organism causing the disease in the affected individual, and this knowledge can only be obtained by careful cultural methods applied to the diseased individual. Without this previous knowledge of the infecting organism, all use of vaccines is certainly to be interdicted.

DR. JAMES TALLEY said that the same things that apply to the use of vaccines apply to the use of medicines, viz., we should not be carried away by hysteria, but should use common sense. The patients who had heard of vaccines often demanded them, whether they were indicated or not. Dr. Talley thought that a great deal of care should be used in the preparation of vaccines. He had seen nephritis and death from hemolysis, caused by badly prepared vaccines, injected by non-medical people.

DR. CLIFFORD B. FARR said that after intravenous injections of formaldehyde solutions practiced by others, he had observed reactions very similar to those seen after the use of vaccines. Is it possible that these reactions are really non-specific protein reactions? Dr. Farr had also seen a case of obstinate sycosis cured by vaccines after other methods had failed.

DR. EDWIN E. GRAHAM said before hearing Dr. Kolmer's talk that he had thought that where serum was given for hemorrhage, serum supplied to the blood something in which it was deficient, probably thrombin, but from what Dr. Kolmer says it would appear that the serum stimulated the spleen and lymphatics of the body to the production of substances which controlled hemorrhage. That is, instead of supplying something lacking, the spleen and lymphatics were stimulated to the formation of these elements. Dr. Graham had had considerable experience in treating pertussis with vaccine—at times with remarkable results, and in other cases with no improvement. He wondered whether this could not be explained by preparation of the vaccine.

DR. ELMER asked the relation of the injection of sea water to the non-specificity of vaccines.

DR. S. MCC. HAMILL stated that in the treatment of disease, either by medicine or any other method, such as vaccine, we often failed to appreciate the natural course of disease uninfluenced by

drugs. In the interpretation of our results we should always take this into consideration.

Another factor that should not be lost sight of is that when watching for the results of treatment, we are apt to study our cases as we have never done before and to have impressed upon us the results which we have been observing for years without appreciating them—such things for instance as abortive attacks of pertussis, pneumonia, etc.

DR. KOLMER said that he did not wish to be understood as an advocate of the clinical use of vaccines in a non-specific manner. He did think, however, that the body had non-specific defenses against disease, and that these were brought into play in combating disease, and that they might be heightened or increased by an injection of a vaccine in addition to the specific action of the vaccine. He was in favor of a rigid examination for the determination of foci of infection before vaccines were administered. Vaccines should be autogenous whenever possible because bacterial species vary greatly. The closer to the unaltered bacterial protoplasm, the better the vaccine. The administration of normal serum in experimental studies tends to show that it stimulates the production of some factor needed in coagulation and probably by stimulating the blood forming organs, sea water contains various inorganic salts and certain amounts of protein, and in this way the injection of it may bring about hyperleucocytosis and otherwise favorably influence certain conditions. He had had no experience with the use of formalin injections. Fatal anaphylaxis did not occur if vaccines were given subcutaneously, although some of the local reactions may in part be anaphylaxis.

In the discussion Dr. Schamberg said that he had omitted to mention the use by his assistant, Dr. Strickler, of a vaccine in ringworm of the scalp. Dr. Schamberg had had opportunity of observing the results of treatment in his several services and could endorse the statement that this was a most valuable method of treatment. In reply to a query he stated that the brilliant results in the 2 cases of sycosis referred to were doubtless due to the fact that the virus was less attenuated and that a greater degree of immunization was thereby effected. He quoted Wright to the effect that "the greater the local reaction

the greater the production of bacterio tropic substances"; the nearer one approaches to active immunization, the greater the curative influence.

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*Stated Meeting, Held May 8, 1917*

THE PRESIDENT, JOHN F. SINCLAIR, M.D., IN THE CHAIR

DR. HARRY LOWENBURG read a paper on "Congenital Unilocular Cyst of the Liver (Hemangioma); Report of a Case with a Brief Review of the Literature."

Dr. Lowenburg's patient was a male, 19 months of age. The chief complaint was abdominal distention, extreme general weakness, gradual emaciation and pallor. Both parents were 23 years of age and healthy. Married 3 years. First pregnancy. No miscarriages. Both parents present negative Wassermann reactions.

Previous History—Only child. Delivery reported to be normal by Dr. Poland. Birth weight said to have been 8½ pounds. Breast fed up to 5 months. Mixed feeding from this time up to 1 year when it was weaned. Dentition inaugurated at 8 months. Somewhat tardy in this respect as to further development. Now has 10 teeth. No other illnesses can be recorded except occasional colds and attacks of fever of short duration and one attack of tonsillitis.

History of Present Illness and Physical Examination—A complete report of the physical examination will not be made. Only those points bearing on the diagnosis will be stressed. Mother states that the abdomen has always been large and that it seems to be getting larger. The child is extremely pale. He has never seemed strong, but yet never seriously ill. He is very weak. His fontanel is open. His head is square. Head sweating is noted. He has never walked. His legs are thin. His intelligence is normal. His ribs are slightly beaded. Weakness has been progressive. He vomits occasionally. There is no jaundice; no edema of feet. Pulse feeble and rapid. Respiration is somewhat hurried. Passes plenty of urine. The mucosæ are pale. Heart, lungs and extremities are negative. There is no adenopathy, nor are hemorrhoids present.

The abdomen is enormously distended. The umbilicus pouches. A large, firm mass which occupies almost the entire abdomen and which seems to spring from the right side corresponding to the normal situation of the liver is felt. Its lower edge is firm and extends to the brim of the pelvis. Thence it skirts upwards toward the left and disappears under the left costal margin. It is not sensitive to the touch. Its surface seems smooth. Fluctuation cannot be demonstrated. There is dulness in the flanks which is fixed. The superficial veins are distended.

Four examinations of the urine presented a specific gravity varying between 1,010 and 1,030. Albumen showed in faint traces 3 times and there were a few hyaline casts and some epithelium and mucus. Bile was absent.

The Blood—Hemoglobin (Talquist) 25%, reds 2,070,000, cells pale, no poikilocytosis; whites 8,500. Polymorphoneuclears 41%, lymphocytes 52%, large mononeuclears 6%, transitionals 1%. The red cells were pale. The Wassermann was negative.

The X-ray examination shows a large mass filling the entire right side of the abdomen down to the brim of the pelvis and also a good part of the left side. From its situation it suggests a tumor of the liver. Its outline corresponds practically to that made out by physical examination. From the varying degrees of tensity of the shadows throughout the mass, it suggests the possibility of cystic degeneration.

Diagnosis—Congenital tumor of the liver, probably cystic in character.

Treatment and Subsequent Course—Exploratory incision advised. Operation by Dr. John B. Deaver. The following notes were kindly loaned to me by Dr. Bowers of the Mary Drexel Home, where the operation was performed: "Incised upper right rectus. Large tumor presented. Tremendous cyst of liver filling entire right side. Tapped tumor with trochar and canula. Dark, bloody (changed) fluid removed. Tumor incised. Large amount of bloody fluid escaped. Walls of cyst 1 inch thick and did not bleed. Piece of wall removed and sent to laboratory. The cyst was unocular. The walls were stitched to the abdominal wall and the cavity packed with gauze."



The following report was made by Dr. Pfeiffer, pathologist to the German Hospital:

Fluid from Cyst—Color dark red. Sp. G. 1,018. Many red blood corpuscles. No bile nor bile pigments. No bacteria nor parasites.

Examination of Tissue from Cyst Wall—Tissue friable, of brown color, and suggests membranous lining.

DR. LOWENBURG then reviewed the literature that he had found bearing on non-parasitic cysts.

DR. E. W. RODENHEISER read a paper on a "Case of Facial Paralysis Possibly Due to Brain Tumor."

The patient was a colored girl, aged 2 years, with a dull, listless expression; was rather poorly nourished and developed.

She was brought to the hospital with a right-sided facial paralysis first noticed in June, 1916.

There was nothing definite in the family history. The paralysis involved all the facial muscles of the right side, the external rectus, the right side of the tongue and apparently some of the throat muscles.

The eye grounds are normal, ears negative. Patient had a verticle nystagmus of both eyes, internal strabismus of right eye, occasional swaying of the head and vomiting, apparently headache, and was quite irritable.

X-ray showed no intracranial tumor. Blood picture normal. Wassermann was negative. Spinal fluid was under no pressure, and normal to examination.

The course in the hospital showed a progressive general weakness until death 7 weeks after admission.

The pathological findings were (a) peritoneal adhesions, (b) tuberculous mesenteric glands, (c) tuberculoma of pons cerebri.

DR. A. G. MITCHELL and DR. W. W. FALKENER read a paper on "Some Features of Cerebrospinal Meningitis in Children," and said: "Since the first distinctly recognized epidemic in this country over 100 years ago, the disease has been epidemic about every 10 years, and more or less prevalent for the following 3 years."

Reserving for later discussion the examination of the spinal

fluid, let us determine the symptoms and physical signs which should influence us to perform the diagnostic lumbar puncture. If the symptom-complex were always complete, diagnosis would be comparatively easy. Unfortunately, typical onset is not always definite and symptoms suggestive of meningeal irritation are not in sufficient evidence to be striking. Furthermore (and this point needs such emphasis that it will be dilated upon later), many of the symptoms are often absent, and certain others are not of diagnostic importance in infants. This is worthy of consideration when we know that about 50% of patients suffering from meningococcus meningitis are under 5 years of age, and 20% under 1 year of age.

Any acute infection in children may begin with the same train of symptoms which are due, in part at least, to the imperfectly developed and therefore unstable and more easily influenced nervous system of the child as compared to the adult. This group of symptoms includes hyperpyrexia, vomiting, headache, convulsions and mental disturbance as evidenced by drowsiness or delirium. Headache and convulsions are the two of this syndrome that might be expected to predominate in a disease that involves primarily the brain and spinal cord. Indeed, this is the case, and in most epidemics these symptoms are among the initial ones.

A careful study of the case histories of patients admitted to the Children's Hospital this year shows that the early symptoms were present in the following order: fever, vomiting, drowsiness, convulsions, rigidity of the neck, headache, chill, tremor and irritability. The frequent combination of fever and vomiting was notable.

The first examination reveals certain suggestive things to the careful observer. Two of the physical findings (hyperesthesia and rigidity of the neck) have already been called to his attention if the child has an intelligent mother or caretaker. Even as early as a few hours after the onset other signs of cerebrospinal irritation, such as a positive Kernig's sign or inability to extend the leg on the thigh when the latter is flexed on the abdomen, and Babinski's phenomenon, are frequently present in normal babies under 18 months. Ankle clonus also may frequently be elicited in babies, although it certainly has pathologic significance if persistent.

A tâche cerebrale to be of value even as a concomitant physical finding should be distinct and broad. Stroking of the abdomen in almost any baby will develop what might be called a mild or moderate tâche.

Involuntary rigidity of the neck is, however, certainly not a normal finding in a child of any age, and is present in most cases of cerebrospinal meningitis during the early stage.

There is great difference in the severity of the infection. Severe fulminating cases occur at the beginning and at the height of the epidemic. Some patients may die in such a few hours that they develop few symptoms except headache and then coma. Others may have such a mild infection as to develop diagnostic features observable only on close inspection. It should be emphasized that in babies especially the diagnosis is often difficult. We have seen 3 infants under 1 year of age, in whom the spinal fluid showed meningococci, whose only deviation from the normal consisted in a tense bulging fontanel, fever and mental apathy.

Recapitulation — The child on whom we are justified in performing lumbar puncture will present a certain picture consisting in abrupt onset; fever; almost certainly vomiting and rigidity of the neck and hyperesthesia; mental apathy or irritability; perhaps convulsions or a chill and usually, if a baby, increased tension of the fontanel. Additional symptoms should of course be looked for, but not waited for. Lumbar puncture especially during an epidemic may be called for with less evidence than the symptoms given above. This is especially true if the puncture can be done under strict aseptic precautions and with close observation of the effect of withdrawal of fluid, realizing that it is a procedure not devoid of danger. "When in doubt, puncture," is an axiom which suggests itself when we consider the frequency of the occurrence of cases with extreme mildness of the symptoms present and absence of other well-defined symptoms.

The first fluid is to be very carefully studied as the meningococci may not be found after the first serum injection given at this time. Its chief characteristics are that it does not reduce Fehling's Solution, contains albumen and globulin, has a cell count decidedly increased over the normal 10 to the cubic millimeter and contains gram-negative intra and extra cellular biscuit-

shaped diplococci. The demonstration of these organisms by smear (or culture) is the definite diagnostic *sine qua non*.

The use of the bacteriolytic serum has materially reduced the mortality and has furthermore done much to lessen the unfortunate and distressing sequelæ in the survivors. It is undoubtedly not as specific as we could wish. Failure to cure depends mainly on two factors: the first of these, early administration, has already been mentioned. We can conceive of no better way of pointing out the moral of using the serum early than presenting Flexner's often quoted statistics: "Injected before the third day 14.9% mortality; injected from the fourth to the seventh day 22% mortality; injected after the seventh day 36.4% mortality."

The second cause for failure of serum therapy probably lies in the absence in the serum of sufficient antagonistic anti-bodies for the particular strain of meningococci infecting the patient. Gordon, in England, and others have done work to prove that the meningococcus is divided into at least 4 different strains, 3 of which are definitely agglutinable and the fourth comprising a group of as yet unagglutinable organisms. This multiplicity of strains is obviated to a certain extent by the use in the preparation of serum of meningococci obtained from many different sources, and explains why, at times, change in the serum used is followed by beneficial results.

Persistence of fever; continued cloudiness or viscosity of the spinal fluid with failure to reduce Fehling's Solution; meningococci still present in stained smear, and continued leucocytosis all indicate the necessity of further treatment. Rigidity is one of the last symptoms to disappear and its continuance does not in itself necessitate puncture or serum injection.

In conclusion, we wish to emphasize two facts which have impressed us during the last 3 months.

Cerebrospinal meningitis is curable in direct ratio to the promptness of treatment with antimeningococcic serum.

While at all times we should be careful to thoroughly examine any sick child, signs of cerebral and spinal irritation are to be especially sought for at the first inspection, during periods of epidemics of cerebrospinal meningitis. This is all the more urgent when the illness has been suddenly ushered in by high



fever, unexplained vomiting, drowsiness, convulsions, or intense headache.

Dr. Mitchell's paper was discussed by Drs. Arnett, Ostheimer, Gittings, Hand, Lowenburg, Sharpe, Carpenter, Eleanor Jones, Mills, Graham, Hamill, Rodenheiser and Mitchell.

DR. W. F. JOHNSTON presented a boy of 13 years of age, suffering with exophthalmic goiter. The family and social history presented only two points, namely, that the father had died of pulmonary tuberculosis, and the only disease that the child had ever contracted was measles.

Five years ago bulging eyeballs were noticed. At this time the thyroid began to enlarge, and the boy complained of palpitation and dyspnea. Examination of the boy reveals a fairly well nourished child, expression is somewhat dull, but modified by the prominence of the eyeballs. Mentality is somewhat impaired. The eyes are prominent. The pupils react equally to light and accommodation. There was widening of the palpebral fissure. The thyroid gland is symmetrically enlarged. Examination of the heart is negative, and there is no increase in cardiac dulness. Pulse rate is 78. Hands show a fine tremor.

Dr. Johnston said that, while this case was not so rare at the age of 13 as it would have been at 8 years when it first came under observation, it is rather unusual because of the patient's sex, since the disease is 3 times as frequent in girls as in boys.

The symptoms of Grave's disease are practically the same in the child as in the adult, and often resemble those of chorea. The disease is rarely fatal in childhood, and usually responds readily to treatment. The various therapeutic measures available aside from those mentioned are:

X-ray, galvanism and thyroidectin.

Adrenalin and Thymus extracts, and in exceptional cases, surgical procedures are indicated.

Dr. Johnston's paper was discussed by Dr. Graham.

## DEPARTMENT OF ABSTRACTS

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### ORIGINAL CONDENSATIONS OF CURRENT PEDIATRIC LITERATURE BY THE EDITORS AND THE FOLLOWING ASSOCIATES

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Gaylord W. Graves.....	New York City	Willard S. Parker.....	Boston, Mass.
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MOLLISON, W. M.: CASE OF HEART FAILURE DURING AN OPERATION FOR THE REMOVAL OF TONSILS AND ADENOIDS. HEART MASSAGE THROUGH AN ABDOMINAL INCISION. RECOVERY. (British Journal of Children's Diseases, March, 1917, p. 42.)

In this case recovery followed after a considerable period of heart stoppage and also exhibited symptoms during the recovery, which have always been followed by death in previous partially successful cases.

The boy, aged six years, was operated on for tonsils and adenoids on account of attacks of bronchitis and asthma. During the administration of the anesthetic of 2 parts chloroform and 3 parts ether the corneal reflexes were not lost. After the operation the boy was apparently in shock. On examination the patient was flaccid, respiration had ceased, pupil was dilated and corneal reflex absent. After stimulation, and the unsuccessful use of Silvester's method of resuscitation, the heart sound could not be heard with a stethoscope even after 0.5 cubic centimeter of pituitrin was injected into the heart.

An incision about 4 inches<sup>1</sup> long in the mid-line was made from the ensiform cartilage to the umbilicus. There was no bleeding, although in the haste the liver was incised also. The heart felt through the diaphragm showed no movement. With the left hand on the chest wall and the right hand behind the heart, pressure was exerted about 90 times to the minute. There was no response for some moments, then some respiratory movements began and continued intermittently. The boy's color improved

and the pupil contracted to 3 centimeters. But the heart did not contract. One cubic centimeter of pituitrin was injected directly into the heart and massage was resumed. After about 20 more squeezes the heart began to beat strongly.

From an estimation of the time employed the heart was stopped not less than 13 minutes and not more than 24 minutes. For the following 2 weeks the patient showed the symptoms of severe cerebral irritation—rigidity of limbs, choreic movements, meningitic cry, and incontinence of urine and feces, due doubtless to damage done brain during cessation of circulation.

The author gives a table compiled from 14 successful cases of heart massage through an abdominal incision. From these and his own case he concludes that heart massage should not be postponed too long, probably not longer than five minutes after heart stoppage has occurred and massage ought always to be carried out through an abdominal wound. CHARLES E. FARR.

GUNSON, E. B.: GANGRENE OF THE LEG FOLLOWING DIPHTHERIA. (*British Journal of Children's Diseases*, August, 1916, p. 237.)

A boy six years old, with a severe faucial diphtheria of four days' duration, was given 20,000 units of antitoxin and repeated on the fifth day. On the eleventh day the pulse became weak, and on the thirteenth day the cardiac dullness was increased. On the seventeenth day the pulse became markedly irregular, with paroxysms of tachycardia and the liver dullness extended to three inches below costal margin. On the eighteenth day he complained of pain in the right popliteal space, with some cyanosis of the skin below the knee. Gangrene first appeared on the twenty-second day on the right small toe. The heart condition was now much improved. The gangrene continued until the thirtieth day, involving the whole right leg below the knee. Pharyngeal paralysis developed on the thirty-fourth day. Improvement in the general condition was gradual, until the seventy-first day, when the right leg was amputated in the middle of the thigh. The popliteal artery was found completely occluded by a thrombus extending two inches above the bifurcation of the artery. The author states that Rolleston, reporting a similar case in 1910, was able to find but 10 cases in the literature.

JOHN B. MANNING.

PARDI, U.: STUDIES OF THE CHANGES IN THYROID CAUSED BY PITUITARY EXTRACT. (*Lo Sperimentale*, January, 1916.)

The object in view was to determine whether modifications of the structure of the thyroid could be caused by pituitary extract alone or by other organic extracts as well. Hallion and Alquier investigated the matter some time before. Pardi had under observation 4 groups of rabbits, 31 in all. They were treated with intramuscular injections of extracts of spleen, pituitary body, and liver. The daily dose was 2 cubic centimeters injected in the gluteal region. Twenty-four hours after the last dose the animals were killed. Results: (a) Changes of structure in thyroid were practically the same following the injections of the extracts. (b) Changes indicate colloid hypersecretion and not hyposecretion. (c) The action of the extracts employed caused vasomotor symptoms stimulating either directly or indirectly the secretion of colloid substance. C. D. MARTINETTI.

BECK, JOSEPH C.: SALIENT FACTS REGARDING TONSILS IN CHILDREN AND ADULTS. (*Annals of Otology, Rhinology and Laryngology*, March, 1917, p. 149.)

The author makes the broad statement that as an indication for operation—tonsillectomy—whether in children or adults, every tonsil is better out than in; and he states that he has no knowledge of a single instance where the patient was worse off after the operation than he was before. Ten contradictions to this general rule are mentioned as follows: 1—All acute inflammations or infections; 2—Luetic processes; 3—Advanced tuberculosis; 4—Advanced cardio vascular changes; 5—Advanced diabetes mellitus; 6—True hemophilia; 7—Blood pressure over 225; 8—Infants under 1 year; 9—Grave mental disease; and 10—In anyone who has never had a sore throat and is in perfect physical condition.

The author goes on to discuss the operation according to his method, and in the discussion of his paper he made the statement that he did not wish the impression made that he would operate on every patient he saw, but he had made the broad statement because we do not know the function of the tonsil except to know that it caused a lot of trouble; it is a cause of disease, a nidus for infection except in the first few years of life.

S. W. THURBER.



# ARCHIVES OF PEDIATRICS

NOVEMBER, 1917

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PUBLISHED MONTHLY BY E. B. TREAT & CO., 241-243 WEST 23D STREET, NEW YORK

## ORIGINAL COMMUNICATIONS

### PYLORIC STENOSIS IN INFANCY \*

By B. K. RACHFORD, M.D.

Professor of Pediatrics, University of Cincinnati.

The purpose of this paper is to report briefly three cases of pyloric stenosis in infancy, which were successfully operated, and in connection therewith to discuss some of the etiological and pathological factors of this condition, upon which these reports have a bearing.

CASE 1. Wm. H. Third child. Male. Born of nervous parents at full term. Was at birth a well-developed, apparently normal baby, weighing eight pounds. He was nursed at regular intervals during the day and once during the night. For sixteen days he appeared perfectly normal, taking breast milk, gaining in weight, and having normal movements from his bowels. With-

\* Read before the Twenty-ninth Annual Meeting of the American Pediatric Society, held at White Sulphur Springs, W. Va., May 28, 29 and 30, 1917.

out apparent cause when sixteen days old he commenced to regurgitate a part of every feeding. During the next few days this stomach irritability increased, and the vomiting became projectile in character. The father of the child, a physician, made the diagnosis of pyloric stenosis. The baby was brought to Cincinnati when he was twenty-three days old. On coming to the hospital he was weak, emaciated and fretful. He vomited after taking food, and the vomiting was markedly projectile in character. When his stomach was filled with water characteristic stomach peristalsis was very marked. No tumor could be distinctly felt. There was some difference of opinion among the Pediatric Staff concerning this point. After two days of careful observation and treatment, the stools showing no evidence that food had passed the pylorus, it was clear that an operation offered the only chance for recovery. From the time this baby came to the hospital until he went to the operating table three days later, he was stimulated by hypodermoclyses of physiological salt solution, 5 oz. every 8 hours.

Dr. J. Louis Ransohoff made a gastroenterostomy, but the baby was so desperately weak at the time of the operation that the pyloric field was not investigated. For some days after the operation the child remained in a precarious condition, and was kept alive by hypodermoclyses of salt solution. He commenced to retain some water and skimmed milk on the third day after the operation, and from this time on he made a very slow but ultimately satisfactory recovery.

At this writing (May 1917), the child is twenty months of age, and is fairly normal in his physical development, notwithstanding the fact that he has to be very carefully fed, to overcome his tendency to diarrhea and indigestion.

On May 9, 1917, nineteen months after the operation, an x-ray of his stomach, taken after a bismuth and milk feeding, showed "a very rapid escape of the opaque fluid through the artificial stoma. The clearance seemed very rapid, as within fifteen minutes almost one-half of the food had escaped from the stomach; none of it passed through the pylorus." An x-ray examination of the upper mediastinum showed no evidence of an enlarged thymus.

*Note*—This is a typical case of rapidly developing complete pyloric stenosis, in which no tumor could be distinctly felt. The rapid passage of food through the artificial stoma has interfered,

and may possibly always interfere with the perfect functioning of the gastrointestinal tract. The end result in this case of gastroenterostomy is nothing like so good as that obtained by the Rammstedt operation in the two subsequent cases.

CASE 2. T. M. First child. Male. His mother is of the highly nervous, intellectual type. For the first three weeks of life this infant was apparently normal, taking breast milk, gaining in weight, having normal milk stools, and no gastrointestinal disturbance. About the beginning of the fourth week he began to regurgitate his food, and a little later had occasional attacks of vomiting, which gradually became projectile in character. Associated with the projectile vomiting there was very marked stomach peristalsis, a pyloric tumor which could be distinctly felt, starvation stools and gradual emaciation. When the baby was ten weeks of age, Dr. Max Dreyfoos, to whom I transferred the case when I left town, decided that an operation was necessary.

Dr. J. Louis Ransohoff made a typical Rammstedt operation, and the child's recovery was rapid and uneventful. Feeding was begun at once, all of the symptoms of pyloric stenosis disappeared, and the child gained rapidly in weight, and continued to make an uneventful and apparently perfect recovery. During the operation Dr. Ransohoff found a pyloric tumor of cartilaginous hardness two centimeters long and one centimeter thick.

When the child was seven and a half months of age, it was found dead in bed. Death was due, as the autopsy findings showed, to an unusually large thymus (65.5 grams).\*

Dr. Woolley, who made the autopsy, reported as follows: "The cause of death undoubtedly lay in the unusually large thymus (65.5 grams), because there was nothing else found in the body which could by any stretch of the imagination be chosen even as a remote cause. Dr. Woolley removed the pyloric portion of the stomach, the pyloric ring and the first part of the duodenum for further study. He found the pyloric orifice normally dilated "and another interesting feature was the disappearance of the pyloric tumor mass, which was plainly shown at the previous operation."

A study of the above case reveals the following interesting facts: First, the pylorus in this child functionated for five months

\* The above case with autopsy findings will be reported by Dr. J. Louis Ransohoff and Dr. Paul G. Woolley. The quotations herein made are from the proof sheets of their paper, soon to be published in the Journal of the American Medical Association.

after the operation, and at autopsy was found to be normally dilated. In other words, following the Rammstedt operation the pyloric tumor mass not only disappeared, but the pylorus resumed its normal physiological functions, thus showing that the end result of this operation is much better than that of gastroenterostomy.

Second, the autopsy findings in this case clearly prove, for the first time, that if a hypertrophic pyloric sphincter is so cut as to leave the pyloric orifice patulous, and prevent muscular spasm of these fibers, the pyloric tumor disappears entirely, and this occurred within a few months.

Third, this case after an apparent perfect recovery died suddenly from thymic death.

Dr. Dudley Palmer, in a recent paper, calls attention to the frequent association of an enlarged thymus and pyloric stenosis, and makes the statement that he "has found five cases operated upon by five different men in Cincinnati, where sudden death followed successful operation for congenital pyloric stenosis. Two of these cases were proved to be thymus cases by subsequent post mortems, one a few days after operation, the other a few months (the above case). The other three cases died suddenly with thymic symptoms."

CASE 3. T. F. Third child. Male. His parents were nervous, intellectual people. He was on breast milk for the first three weeks, and during this time he gained in weight and had normal movements from the bowels, and had no gastrointestinal disturbance. At the end of the third week he was put upon artificial food. About the beginning of the fourth week he commenced to regurgitate, and later to vomit his food. From this time on the symptoms of pyloric stenosis gradually developed. He had projectile vomiting, gastric peristalsis, a well defined pyloric tumor, hunger stools, and progressive loss of weight. When the baby was seven weeks of age, Dr. Max Dreyfoos, to whom I referred the case when I left the city, called in Dr. J. Louis Ransohoff, who made a typical Rammstedt operation. Following the operation the child made a rapid and uneventful recovery.

At the time of the operation the pylorus "was occupied by a large firm ring of muscular tissue, completely stenosing the pylorus."



Six months after the operation the child was brought to me suffering from thymic asthma. An x-ray picture showed a large thymus. After x-ray treatments the asthma and cough disappeared, and a subsequent x-ray picture demonstrated that the thymus had been reduced to its normal size. At the present time the child is nine months of age, and is a perfectly developed, normal baby. An x-ray examination of his stomach shows that the stomach is emptying itself normally through the pyloric orifice, demonstrating that in this child the cutting of the pyloric sphincter not only relieved the stenosis but left a perfectly functioning pylorus, which allowed the food to escape from the stomach through the pyloric orifice at the normal rate.

*The Relationship of Enlarged Thymus to Pyloric Stenosis—*

It will be noted that two of the three cases of pyloric stenosis above recorded had a marked hypertrophy of the thymus gland which was not discovered, and which produced no symptoms until five or six months after they had been successfully operated upon for pyloric stenosis. They suffered no inconvenience from the anesthetic (ether) during the operation. Further observations may determine whether the simultaneous occurrence of enlarged thymus and pyloric stenosis in these cases was merely a coincidence, or whether there is an etiological relationship between the two conditions.

*Time for Operation—*The fact that the Rammstedt operation now in vogue may be followed by a perfect recovery, with the pylorus functioning in a normal manner, as demonstrated in Cases 2 and 3, together with the fact that this operation is much simpler and safer than the old operation of gastroenterostomy, which may be followed by a not altogether satisfactory recovery from the too rapid emptying of the stomach, is a convincing argument for early operation in clearly defined cases of pyloric stenosis, which do not yield readily to medical treatment.

*Etiological Suggestions—*It is a fact beyond dispute that congenital hyperplasia of the pyloric muscle is a pathological entity which has been demonstrated in the still-born fetus at term. But this pathological fact does not prove that the well-known clinical syndrome, produced by pyloric stenosis in infancy, is always due to this condition, nor does it prove that congenital hyperplasia of the pyloric sphincter is the important factor in producing this symptom group. On the other hand, the fact that the thick-

ening of the pylorus in these cases is due almost wholly to an increase in the circular fibers, would indicate that the thickening of the muscle is most probably due to an hypertrophy of the circular fibers, resulting from an excessive muscular action or from some other unknown cause. That the thickening of these circular muscle fibers is not as a rule congenital, but is due to some pathological factor, which causes the normal muscles to hypertrophy, is indicated by the fact that when these muscular fibres are severed, as in the Rammstedt operation, the hypertrophied muscle entirely disappears in the course of a few months. This operation relieves the irritability and muscle spasm of the circular muscle fibers of the pylorus, and with this loss of excessive muscular action the muscle soon returns to its normal size. This fact is demonstrated in Case No. 2. If the muscle spasm is not a factor in producing a gradual thickening of the pyloric sphincter, it is difficult to understand how a simple section of these fibers can and does cause a total disappearance of the muscular thickening within a short time.

It is my belief, therefore, that the term "congenital hyperplastic or hypertrophic stenosis," or, even the term "congenital pyloric stenosis" is in the present state of our knowledge unwarranted in describing this particular symptom group.

The term "pylorospasm" when used in the nomenclature of these cases is also in the present state of our knowledge unjustifiable and misleading, since pylorospasm, as a pathological factor in these cases, is associated, sooner or later, with more or less thickening of the pyloric sphincter. The most appropriate term for these cases, therefore, appears to be "pyloric stenosis in infancy." This term does not commit one to the congenital origin of this disease, nor does it attempt to differentiate between the importance of the muscle spasm and thickened muscle in the etiology of this disease. In the term "infantile pyloric stenosis" the etiology of the condition is not hypothecated, and the important pathological condition is definitely stated.

There is perhaps no clinical fact better established than that many cases of pyloric stenosis in infancy have recovered without operation. My own experience leads me to believe that a large percentage of these cases get well under medical treatment. In the light of the pathological and x-ray findings in Cases 2 and 3, it seems reasonable to infer that when the gastric and pyloric irritation is relieved by medical treatment, and the case progresses

to a satisfactory recovery, the thickened pyloric muscle will gradually disappear when the spasm and irritation are relieved, as it did in Case No. 2. My clinical experience confirms me in this belief. The fact that the pyloric tumor persists following the recovery of cases operated on by gastroenterostomy, is not, to my mind, inconsistent with this clinical inference, since in these cases the muscular contraction is never relieved, and the pylorus never resumes its normal function.

From a clinical standpoint there is little to indicate that there is any congenital factor in the majority of these cases, except a neurotic inheritance. In the vast majority of cases, as in the three cases reported, the gastrointestinal canal functionates normally for two or three weeks, and then, following gastric irritation, the typical symptom group of pyloric stenosis either gradually or rapidly develops.

It is not improbable, however, that some of these cases may be born with a thickening of the pyloric muscle, due to causes acting upon these muscle fibers before birth, but it is altogether improbable, in the light of our present clinical and pathological data, that the majority of these cases so originate.

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EXPERIMENTAL STUDIES IN THE ETIOLOGY OF ACUTE EPIDEMIC POLIOMYELITIS (Journ. Amer. Med. Assoc., 1916, lxvii, p. 1,205.) J. W. Nuzum and M. Herzog have isolated a similar organism to that described by Rosenow, Towne and Wheeler from the central nervous system, tonsils, mesenteric glands and cerebrospinal fluid from cases of poliomyelitis, and have produced experimental lesions with it in animals. They, too, have found the organism to be polymorphic. Aerobically it grows large, but under anaerobic conditions it assumes a form so small that it may pass through a Berkefeld filter. In considering this gram-positive coccus in its etiological relation to acute poliomyelitis it must be remembered that it may act as a carrier of a real ultra-microscopic virus, which, together with this micrococcus, might still be transferred in cultures and be transmitted in inoculations. In tissues from the central nervous system preserved in 50 per cent. sterile glycerine this same micrococcus was alive after a period of thirty-five days, and could be cultivated in pure culture on suitable media.—*The British Journal of Diseases of Children.*

# THE INTRADERMAL REACTIONS TO PROTEINS OF INFANTS SUFFERING FROM GASTRO- ENTERIC DISORDERS\*

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The following report is of work done on only one phase of an investigation of the skin reactions of infants and children; this particular study being concerned with the reaction of infants suffering with gastroenteric disturbances to the intradermal injection of several proteins; chiefly those of milk. Only a fraction of the work contemplated is here dealt with; the report being made at this time because of an unavoidable and indefinite interruption in the work of the writer.

During recent years considerable evidence has been advanced to show that, under certain conditions in infancy, foreign proteins may pass through the intestinal mucosa unchanged, and the assertion has also been made that such parenteral introduction may result in the sensitization of the individual to the protein concerned.

By use of precipitin tests applied to the blood serum, Ganghofer and Langer<sup>1</sup> found that the intestinal tract of animals less than eight days old allowed the passage of beef and egg protein when ingested in physiologic quantities. In older animals this did not occur, unless much larger quantities were given, or when the intestinal mucosa was injured. They also obtained positive tests in two infants suffering with nutritional disturbances. However, Hamburger and Sperk,<sup>2</sup> working with young animals, were unable to corroborate these findings.

Hayashi,<sup>3</sup> after feeding fifteen to twenty grams of raw egg albumin to normal infants, was unable to find the egg protein in the urine. But, on the administration of even very small quantities to infants with eczema or gastrointestinal disorders the protein was demonstrable in the urine. By precipitin tests on the urine Lawatschek<sup>4</sup> has shown that the gastrointestinal tract of infants under ten days of age allows foreign protein to pass unsplit, and that an appreciable quantity is excreted in the urine. Lawatschek also asserts that the permeability of the infant's in-

\* From the Otho S. A. Sprague Memorial Institute Laboratory of the Children's Memorial Hospital, Chicago, Ill.



testinal mucosa to foreign protein decreases with the advance in age of the child, but increases during nutritional disturbances. Investigation that tends to corroborate the last statement has been done by Modigliana and Benini<sup>5</sup>.

Further proof that heterologous protein may be absorbed unchanged from the intestine of infants with gastroenteric disorders, while usually not from that of the normal infant, has been obtained by use of precipitin reactions applied to the urine by Lust,<sup>6</sup> and Schloss and Worthen<sup>7</sup>.

The latter authors used a precipitating serum produced by the injection of rabbits with whey proteins precipitated by saturation with ammonium sulphate.

Vaughan, Cummings and McGlumphy<sup>8</sup> were able to sensitize guinea-pigs to egg protein with the blood of rabbits which had been fed that protein; and Van Alstyne and Grant<sup>9</sup> obtained corroboratory findings with urine of dogs to whom foreign protein had been administered by means of Thiery-Villa fistulas. Lust<sup>6</sup> fed various forms of foreign protein to infants with nutritional disturbances, injected guinea-pigs with urine from these patients, and after three weeks obtained positive anaphylactic tests for the homologous protein.

That some degree of sensitization may result from absorbed unhydrolysed foreign proteins, is indicated by the work of Rose-nau and Anderson<sup>10</sup> who, in feeding experiments with animals, were succesful in getting an anaphylactic response to the protein fed.\* The findings of Moro,<sup>11</sup> and those of Bauer<sup>12</sup> are also very suggestive. The former made postmortem examinations of the blood of twenty-two atrophic infants, and in two found milk precipitins; while the latter demonstrated complement deviation for milk protein, as well as precipitins, in the blood of four atrophic infants.

Investigation of hypersensitiveness to milk by means of intradermal injection of milk proteins has, up to this time, been confined chiefly to eczema, asthma, hay fever, and certain cases exhibiting clinical manifestations of anaphylactic shock on the ingestion of cow's milk, and the considerable literature which has accumulated on these subjects is hardly within the scope of this paper which is concerned only with the intradermal reactions to milk proteins of infants suffering from acute or chronic gastrointestinal disturbances.

\* See the literature in the paper by Kleinschmidt<sup>13</sup>.

This study embraces, in all, the intradermal reactions of forty-three infants; twenty-six of whom were subject to gastroenteric disorders, or atrophy resulting therefrom; the remaining seventeen being patients in the hospital for some other clinical condition, and not having manifestations of digestive disturbance. Unfortunately a large number of perfectly normal breast and artificially fed infants were not available. The essential data and findings of the tests are set forth in the accompanying tables.

The egg, cow's milk and human milk albumins were all obtained by precipitation with ammonium sulphate, the per cent. of the last substance remaining in the finished product of each being determined by analysis, and in every case control injections made of a sterile ammonium sulphate solution whose concentration far exceeded that of any one of the albumin solutions. The egg protein was used as a representative of those animal proteins least likely to have been previously ingested by the infants; the milk proteins being employed for the converse reason. In a few cases blood serum from the cow was used in view of the possibility of a correlation between reactions to it and the proteins of cow's milk. The caseinogen of the cow's milk was obtained by acetic acid precipitation, twice repeated. The final neutral solution was obtained by the addition of sodium hydroxide solution. A sterile suspension of Kaolin (Merck) in freshly distilled water was used for the purpose of observing the reaction, if any, to a foreign body. It was interesting to note in this connection that while the intracutaneous injection of this substance in the adult was followed by local hyperemia and a swelling that persisted for many hours, in the infant the reaction was limited to a degree that could only be reasonably ascribed to trauma.

Solutions for injection were always used freshly prepared, and sterility insured by previous inoculation and incubation of culture media. All were used in one per cent. strength in freshly distilled water, with the exception of that of ammonium sulphate which was of five per cent.

The injections were made intracutaneously, under aseptic precautions, with a tuberculin syringe, one tenth of a cubic centimeter being given.

The term "gastroenteritis" as here employed is rather a "blanket" one, and does not refer specifically to cases exhibiting fever, vomiting, blood and pus in the stools, etc., without exception; but means rather to designate cases in which one or more of these

symptoms was present with other accompanying definite indications that the infant was suffering from well-marked digestive disturbance.

In every case following the injection of each substance used, a local redness, with more or less edema in many, developed in from a few seconds to three or four minutes. This hyperemia usually slowly increased, reaching its height in ten to fifteen minutes, at which time the extent varied from one to four centimeters in diameter. In the event of the test resulting negatively, subsidence of whatever redness and edema that was present then set in, and was complete in from twenty to thirty-five minutes. However, the behavior of a positive reaction was strikingly different. After thirty minutes, in a large majority, an area of cutaneous hyperemia with some degree of palpable edema persisted, varying from one-half to three centimeters in diameter. In a few instances the behavior up to this point was as described for a negative reaction. But then the redness reappeared about the injection site at some time during the subsequent two hours and the reaction ran thereafter the usual course. Whether the presence of the cutaneous redness was uninterrupted or not a positive reaction at the end of eighteen hours, and in many even after twenty-four hours, exhibited an area of hyperemia and palpable infiltration of from one to two centimeters in diameter. Every test recorded in the table as positive showed at the end of eighteen hours at least an area of redness and infiltration of this extent.

Kleinschmidt<sup>13</sup> injected intracutaneously 0.1 c.c of a Berkeley filtrate of cow's milk inactivated at 56°. In four adults and eight children (age not given) a slight reddening of 1-2.5 cm., in diameter without swelling was noted the next day. In three adults and six children there was no reaction. After forty-eight hours there was no more visible change in the skin of any of the injected individuals. He claims that such transitory reactions occur in quite a similar manner after the injection of Ringer's solution. I have had no experience with Ringer's solution. Naturally, it is better to avoid the use of alkaline solutions for intracutaneous injections if not necessary. We may note, however, that half saturated ammonium sulphate solutions and 20 per cent. sodium chloride solutions gave not much more of a reaction than physiological saline solution. The arrangement of my observations with the rather numerous control injections leave no doubt

whatever that the reactions which were noted are of a definite significance and there is no choice but to interpret them as belonging to the group of allergic reactions.

The cases serving for our observations are arranged in two tables. The first table contains such patients which did not suffer from gastroenteritis or atrophy; the second table, those which were admitted to the hospital for intestinal disorders.

Of seventeen infants without gastroenteritis or atrophy, only five gave positive reactions to any one of the substances injected. Three of these were cases of eczema: Chas. H. having bronchitis as well; Harold D., pneumonia; while Helen had eczema alone. All three reacted positively to lactalbumin of cow's milk; one also to cow's caseinogen. Of these children two gave no history of gastroenteritis, and no claim can be made that their sensitization came about as a result of such condition, however, the possibility that they had previously absorbed unsplit foreign protein is indicated by the work of Hayashi<sup>8</sup> who, after administering small amounts of foreign proteins to eczematous infants, demonstrated the homologous proteins in the urine.

The fourth case, Elizabeth O., gave markedly positive reactions to lactalbumin and caseinogen of cow's milk. The baby had pneumonia, unattended by either gastroenteric disturbance or eczema. However, on inquiring more closely into her history, it was learned that three months previously, while on a modified cow's milk feeding she had undergone a severe attack of gastroenteritis.

The fifth case, Lorraine C., suffering from an acute and very severe attack of scurvy, showed, at the end of twenty-four hours, about the injection site of the lactalbumin of cow's milk, a deep bluish-red area of cutaneous reaction, measuring 2.5 centimeters in diameter, with marked infiltration and elevation of about 2 or 3 millimeters.

The remaining twelve cases gave no reaction whatever to any of the injections. In none of them was a history of previous gastroenteritis obtainable, each having been in health up to the onset of the illness for which they were brought to the hospital. The possibility that the acute illness, in most cases, accompanied by high fever, as in the cases of pneumonia may have had some inhibiting influence on the skin reactions suggests itself. However, there was nothing encountered to substantiate this.



# REACTIONS IN CONDITIONS OTHER THAN GASTROENTERITIS AND ATROPHY.

NAME AND DATA		Egg Albumin 1%	Cow's Lactal- bumin 1%	Cow's Casein- ogen 1%	(N H <sub>4</sub> ) <sub>2</sub> S O <sub>4</sub> 5%	Kaolin 1%	Na Cl 1%	von Pirquet	Schick	Human Lactal- Serum bumin
Joseph H., age 17 mos.	Birth wt. 5 lbs. pres. wt. 19 lbs. Breast fed 1 yr. No previous illness. Lobar pneumonia.	0	0	0	0	0	0	0	+	0
Edward R., age 1 yr.	A normal breast fed baby.	0	0	0	0	0	0	0	0	0
Bruno K., age 3 yrs.	A normal child save for prolapse of rectum. Breast fed 1 yr.	0	0	0	0	0	0	0	0	0
Richard M., age 13 mos.	Breast fed for 5 wks.; Cow's Milk, etc., since. Had severe attack of enteritis at age of 4 mos. Bronchitis.	0	0	0	0	0	0	0	0	0
Virgil B., age 2 mos.	Cow's milk since birth. No intestinal disturbance. Diagnosis, underfeeding.	0	0	0	0	0	0	0	0	0
Helen S., age 7 mos.	Breast fed 3 mos.; Cow's milk since. Eczema.	0	0	0	0	0	0	0	0	0
Frank J., age 15 mos.	Breast fed. Wt. 18 lbs. Lobar pneumonia.	0	+	0	0	0	0	0	0	0
Elizabeth O., age 14 mos.	Wt. 17 lbs. Breast fed 9 mos. Duration of present illness 4 days. Lobar pneumonia.*	0	0	0	0	0	0	0	0	0
Anna T., age 11 mos.	Wt. 19 lbs. Breast fed 9 mos.; Cow's milk since. Duration of present illness 1 Acute catarrhal jaundice.	0	+	+	0	0	0	0	0	0
Lorraine C., age 9 mos.	Birth wt. 7½ lbs. pres. wt. 12 lbs. Never on breast; always on cow's milk or Mellin's food. Scurvy for 1 mo.	0	0	0	0	0	0	0	0	0
John G., age 14 mos.	Birth wt. 1 pres. wt. 17 lbs. Breast fed entirely. Lobar pneumonia and Otitis Media.	0	++	0	0	0	0	0	0	1
Harold D., age 11 mos.	Wt. 16 lbs. Breast fed 6 mos.; proprietary and cow's milk since (attended by some vomiting and diarrhoea). Is rachitic and has slight eczema. Lobar pneumonia.	0	0	0	0	0	0	0	0	0
Donald F., age 13 mos.	Birth wt. 1 pres. wt. 16 lbs. Breast fed 1 mo.; since modified cow's milk. Nephritis; purpura for 7 wks.	0	+	0	0	0	0	0	0	0
Pasquale P., age 6 mos.	Birth wt., feeding, etc. Sick 3 days. Lobar pneumonia. (Is from an asvhum)	0	0	0	0	0	0	0	0	0
Edward McM., age 9 mos.	Pres. wt. 17 lbs. Entirely breast fed. Ill 3 days. Lobar pneumonia.	0	0	0	0	0	0	0	0	0
Fred M., age 18 mos.	Birth wt. 10 lbs. pres. wt. 22 lbs. Nursed on breast 18 mos. Duration of illness 4 days. Broncho-pneumonia.	0	0	0	0	0	0	0	0	0
Chas. H., age 1 yr.	Wt. 16½ lbs. Feeding, Breast 2 wks.; Cow's milk etc., since. Duration of illness, 5 days. Bronchitis and eczema.	0	0	0	0	0	0	0	0	0

\*Had attack of severe gastroenteritis at age of 11 mos.

# REACTIONS IN GASTROENTERITIS AND ATROPHY.

## NAME AND DATA

	Egg Albumin 1%	Cow's Lactalbumin	Cow's Caseinogen	(N H <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub> 5%	Kaolin 1%	NaCl 1%	Pirquet	Schick Lactalbumin 1%	Human Lactalbumin	Sheep's Serum	Beef Serum
Margaret M., age 6 mos. Birth wt. 7½ lbs. Never on breast. Cow's milk only. Atrophy.	0	+	0	0	0	0	0	0	0	0	0
Annie K., age 5½ mos. Breast fed 6 wks.; Cow's milk since. Wt. 7 lbs. Atrophy.	0	++	0	0	0	0	0	0	0	0	++
Katharine K., age 9 mos. Cow's milk only. Wt. 10 lbs. Atrophy.	0	+	0	0	0	0	0	0	0	0	0
Amber P., age 1 yr. Birth wt. 6½ lbs. pres. wt. 11 lbs. Breast fed 3 mos. Cow's milk since. Atrophy.	0	+	0	0	0	0	0	0	0	0	0
Mary T., age 16 mos. Birth wt. 1 pres. wt. 13½ lbs. Breast fed 7 mos., then cow's milk mixture. Acute gastroenteritis. Ill 2 wks.	0	+	0	0	0	NaCl 5%	0	0	0	0	0
Harold W., age 3 mos. Birth wt. 7 lbs. pres. wt. 9 lbs. Breast fed 6 wks.; since certified cow's milk. Ill 4 wks. Acute gastroenteritis. Retropharyngeal Abscess.	0	+	+	0	0	0	0	0	0	0	0
Baby P., age 3 mos. Birth wt. 6½ lbs. (1 mo. premature) pres. wt. 7½ lbs. Breast fed 3 days; since cow's milk and cereals. Acute gastroenteritis.	0	+	0	0	0	0	0	0	0	0	0
Paul F., age 15 mos. Birth wt. 6½ lbs. pres. wt. 19 lbs. Feeding, modified cow's milk since birth. Duration of illness 3 wks. Acute gastroenteritis.	0	+	0	0	0	0	0	0	0	0	0
Francis G., age 4 mos. Birth wt. 8 lbs. pres. wt. 10 lbs. Breast fed 6 wks.; cow's milk since. Enteritis. Duration of illness 10 lbs. Cow's milk.	0	+	+	0	0	0	0	0	0	0	0
Joe B., age 4 mos. Wt. 9 lbs. at present. Never on breast. Cow's milk.	0	+	0	0	0	NaCl 1%	0	0	0	0	0
Griffiths, age 13 mos. Fed cow's milk. Pres. wt. 12 lbs. Atrophy-pneumonia.	0	+	0	0	0	0	0	0	0	0	0
Roy S., age 3 mos. Fed cow's milk. Gastroenteritis and Pyelitis.	0	+	0	0	0	0	0	0	0	0	0
Richard J., age 3½ mos. Fed entirely on cow's milk. Atrophy.	0	+	0	0	0	0	0	0	0	0	0
Hubert J., age 5 mos. Breast fed 1 mo.; Cow's milk since. Birth wt. 7 lbs. pres. wt. 7½ lbs. Atrophy.	0	+	0	0	0	0	0	0	0	0	0
Edward D., age 11 mos. Pres. wt. 12½ lbs. Breast fed 2 wks.; Cow's milk dilutions since. Atrophy.	0	+	0	0	0	0	0	0	0	0	0
Fannie F., age 8 mos. Birth wt. 8 lbs. pres. wt. 6½ lbs. Breast fed 10 days; since cow's milk. 2 mos. Gastroenteritis. Atrophy.	0	+	0	0	0	0	0	0	0	0	0
Chas. D., age 2 mos. Birth wt. 8½ lbs. pres. wt. 7 lbs. Breast fed 2 wks.; since cow's milk and barley water. Gastroenteritis and Atrophy.	0	+	0	0	0	0	0	0	0	0	0
Edward K., age 6 mos. Birth wt. 4 pres. wt. 10½ lbs. Breast fed 5 wks.; Cow's milk since. Atrophy.	0	+	0	0	0	0	0	0	0	0	0
Mike K., age 3 mos. Pres. wt. 6 lbs. Feeding condensed milk only. Atrophy.	0	+	0	0	0	0	0	0	0	0	0
Theresa G., age 6 mos. Breast fed 1 mo.; since condensed and cow's milk. Ill for 3 mos. Gastroenteritis and Atrophy.	0	+	0	0	0	0	0	0	0	0	0
Edward B., age 6 mos. Wt. 10 lbs. Previous history unobtainable. Gastroenteritis.	0	+	0	0	0	0	0	0	0	0	0
William D., age 18 mos. Birth wt. 7½ lbs. pres. wt. 15 lbs. Breast fed 11 mos.; cow's milk, etc. Acute gastroenteritis.	0	+	0	0	0	NaCl 5%	0	0	0	0	0
Elizabeth R., age 1 yr. Birth wt. 7 lbs. pres. wt. 15 lbs. Breast fed 11 mos.; Cow's milk since Ill 2 wks. Gastroenteritis and Otitis Media.	0	+	0	0	0	0	0	0	0	0	0
William P., age 11 mos. Pres. wt. 16 lbs. Breast fed 1 mo.; since cow's milk mixture. Gastroenteritis.	0	+	0	0	0	0	0	0	0	0	0
Earl F., age 6 wks. Breast fed 1 mo.; Cow's milk since. Sick 2 wks. Vomiting and diarrhoea, congenital lues, gastroenteritis.*	0	+	0	0	0	0	0	0	0	0	0
Edward M., age 3 mos. Wt. 6 lbs. Feeding cow's milk. Sick for 3 wks. Gastroenteritis and Atrophy.	0	+	+	0	0	0	0	0	0	0	0

\* Wassermann ++, died at age of 7 weeks.

Turning to consideration of the skin reactions in children suffering from gastroenteritis or atrophy, the striking finding is that of twenty-six infants, twenty-three gave definite intradermal reaction to lactalbumin of the cow. Three cases reacted positively to cow's caseinogen. The much greater reactivity to lactalbumin is in agreement with the observation that almost all allergic milk reactions proceed better with lactalbumin than with caseinogen. (See Versell. *Zeitschr. f. Immunitäts Forschung*, 1915. Vol. xxiv, p. 267).

While the above findings are too few to admit of definite conclusion, they at least suggest that sensitization to cow's milk proteins does occur in acute or chronic gastroenteric disturbance, and that such sensitization can be demonstrated by intradermal injection of small amounts of those proteins, and further that the lactalbumin is the protein to which, probably, sensitization most easily occurs.

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## FURTHER SUGGESTIONS FOR IMPROVEMENT IN OUTPATIENT WORK WITH CHILDREN

BY STAFFORD McLEAN, M.D.

New York

My first article on Outpatient Work with Children met with so much sympathy and interest that I feel some further remarks along the same lines may be the means of stimulating others to give the most serious thought to one of the most important problems confronting physicians in large centers today.

If the city of New York were sharply divided into dispensary districts and mothers were allowed to bring their children and infants only to the dispensary in their own district, more efficient care and better service could be rendered those who through force of circumstances are obliged to seek dispensary relief. It is just as much the duty of the Health Department to see that those who attend dispensaries get the most efficient treatment, as it is the duty of the Health Department to aid in the prevention of the spread of infectious diseases. If a citizen sells a bottle of bad milk or carts a garbage can through the city without a proper cover he is arrested and fined even though he is an ignorant man and perhaps unfamiliar with the laws. But a group of physicians may conduct a dispensary and advertise medical relief which is not relief, drug children without examination, overlook tuberculous conditions in a child and expose the other children in the family to the disease, defy all the rules of accepted medical practice and yet there is no interference. A dispensary advertises that it has treated thousands of cases a year. Those who contribute to its support judge its worth by its activity and those who should correct the evil seem willing to let conditions continue as they have been. Living has become so complicated of late that considerably more than 25% of the children of the city are subjects for outpatient care.

During the month of March, 1917, at the dispensary of the Babies' Hospital there were 573 cases admitted, most of whom were infants, a majority of whom made several visits; 29% of these admissions lived within three-quarters of a mile of the hospital, the other 71% were recruited from all parts of the city, about 20% coming from the Bronx, which is from 4 to 5 miles from the dispensary. Many lived in Brooklyn, an



hour's journey from the dispensary, and a few came from the lower east and west sides of Manhattan. In reaching our location some had to traverse the prospective districts of 2 or 3 clinics, at any one of which they might have been expected to receive good treatment. Almost any children's clinic in the city will tell the same story. Those who live in the Bellevue district may be seen in the outpatient department of Mount Sinai Hospital and those from the Mount Sinai district at Presbyterian and Bellevue.

If there is a measles epidemic in the West Fifty-Ninth Street district there are certain to be cases in the pre-eruptive stage waiting for admission to the Vanderbilt Clinic. Sitting on the same benches are sick children, highly susceptible to infection, from every neighborhood in the city. They contract measles and in their turn pass on the disease in their own neighborhood. If they live at some distance, it may take them a half to three-quarters of an hour to reach home. In returning, they sit in the street cars and jeopardize the health of other children who use the same public carrier. The same conditions exist with other infectious diseases. In attending their own neighborhood clinic they either carry the children or bring them in baby carriages and thus reduce to a minimum the chance of contact. The admitting physician at the Model Dispensary isolates the infectious diseases as well as those at all suspicious looking and, with the permission of the Health Department, they are taken directly home or sent to the Isolation Hospital.

To this plan of districting the city with the idea of offering better service to the infants and children who must attend dispensaries there are offered many objections, none of which in the opinion of the writer are very serious, provided all dispensaries are brought up to a certain standard.

The Outpatient Department where I do my work has a clientele made up in part of intelligent and observing mothers who come from all parts of the city. I have questioned a great many regarding the above-mentioned remedial changes. Some state that in the dispensary in their own district the examinations are hurried and slipshod, due to the fact that the doctors in attendance try to see too many patients in a short clinic period, that the directions as to feeding are not explicit and that too much is left to their imagination. Others state that a friend's infant has done well under our management and in consequence they bring their

child with the idea of getting more of the same kind of treatment. Others do not know of any dispensary in their own neighborhood. A few have tried their own and think that further opinion will improve the child's condition, and there is a last group, few in number to be sure, who go from dispensary to dispensary seeking relief for a child who is beyond medical help.

Most of these different groups will be satisfied if they can attend an outpatient department in their own district which measures up to a certain standard, in fact the advantages will be so obvious that they will appreciate the benefit, directly the change is made.

If every children's dispensary had an admitting physician, trained physicians to examine the cases, a laboratory and a clinical pathologist, a nose and throat specialist with a well-conducted follow-up system and trained social workers, the economic gain would be so apparent that the dullest mind would be able to see the advantages of the change.

Under the present system the visiting nurses have to cover wide areas in following up their cases and much valuable time is lost in getting about. If their efforts were confined to a small area, one nurse could do the work which two accomplish at present and do it much better. We might even be able to have every child followed to the home and until this is done in every case we are not doing our best in the way of giving dispensary relief.

Some few dispensaries in New York City have physicians attached to their staffs who make home visits. I am not prepared to comment on the value of this system as it is managed at present, but to me there is no doubt that if there were a systematized co-operation between the inside dispensary man, the outside man and the social worker in a particular district that the combined efforts would do much toward the prevention of infant mortality. If they were intimately connected with an obstetric hospital, the same type of department doing prenatal work, the advantages would be obvious. There would be no waste of effort and no gap between the obstetrician and the pediatricist. The mortality of the first month, which is so high at present, would be reduced. With these different forces dividing their efforts in different localities this much-needed co-operation is impossible.

The boarding out of sick infants is being tried on a wider scale than ever before. In a few years the system will be adjusted to allow sick infants to be sent direct from a dispensary to homes allotted to the care of special types of cases. It will be simpler to recruit homes for this type of care if the social workers and the outpatient physicians are more familiar with the people and conditions in their own dispensary neighborhood.

The dispensary which has a careful, thorough follow-up system, a boarding-out service, home visiting physicians, all uniting and co-operating with a group doing antenatal work, will represent a force so potent that the death rate of 75 per 1,000 will soon be achieved.

The desired standard for dispensaries cannot be maintained unless the physicians in attendance receive a salary. There are so many good opportunities for young medical men, positions which offer experience and a living salary, hospital positions which offer more than dispensaries, that the difficulty of recruiting the right types for outpatient work is becoming each year more difficult. If the dispensary governors are unable to raise the funds to provide salaries then the city should be called upon to subsidize the work. It would be far more profitable for the city to spend \$50,000 a year providing salaries to prevent disease among infants than to subsidize hospitals to the same amount for their care when ill.

When the direct tax on incomes is increased the hospitals and dispensaries will feel the loss in contributions on which many have counted for their upkeep. If this should prove the case the state or the city will have to shoulder the burden which is bound to come in time. From the viewpoint of value received in the way of disease prevention the dispensary offers more than the hospital for the money invested. One way of preparing for this condition is to have the city show a keener interest in the conduct of dispensaries and invest a little money toward their improvement by paying the physicians. If outpatient clinics were under the direction of the Health Department, a more efficient watch could be kept on their activities. A supervisor of dispensaries, who would be responsible for the standardization and the proper management of the dispensaries throughout the city and working under the orders of the Health Department, could be provided. If they were not keeping up to the standard the supervisor could make remedial suggestions. If these were

not acted upon he would have the authority to close the dispensary. If a dispensary were closed now and again for doing poor work those on the borderline might be stimulated to make a few changes in their management.

For the mothers who object to being confined to the limit of a neighborhood dispensary for fear of missing better treatment in some other part of the city, for other mothers whose children are not progressing favorably under the care of one particular group of physicians, and for the chronic, dissatisfied types who always think they are being deprived of their individual rights, I suggest an innovation of what might be called a consultation dispensary, to be managed by the Health Department and to accept only those cases which have been referred from another dispensary and for a brief period of observation only.

The physicians in attendance might be recruited from all the children's clinics in the city, each dispensary sending in rotation a man for a fortnight every 6 months. These men would be the ones who had had the greatest experience in outpatient work. As most dispensaries for the care of infants and children have their hours in the afternoon, the consultation dispensary could operate in the morning so that the case seen in the afternoon in the neighborhood clinic could be sent to the consultation dispensary on the morning following.

The districting of the city for the purpose of providing more efficient service will result in a tremendous economic gain. The time saved by the mothers who traverse the city for medical relief which might be obtained around the corner could be employed in divers ways for the benefit of their homes and the care of their children. I do not think the ideas here outlined would be difficult to put into practice provided the State Board of Charities and the New York Department of Health took up these considerations seriously.

We know that the dispensary problem is a difficult one and we feel that it is being handled badly. It is one of the complex problems we have to face. There are some who think it would be better to close all dispensaries than have the majority of them furnish the type of medical relief which they offer at present under the label of modern medical treatment. Hospital care has progressed tremendously in the last decade, but outpatient care remains about the same as when dispensaries were established



in London toward the close of the eighteenth century. Many excellent committees have made suggestions for improvement in outpatient care in New York City. We know the results. It is for this reason I suggest that either the State Board of Charities or the Health Department attack the problem from a new angle and demonstrate that stronger measures will accomplish more than suggestion or coercion.

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CURE OF SUPPURATIVE MENINGOCOCCAL IRIDOKHOROIDITIS BY INJECTION OF ANTIMENINGOCOCCAL SERUM INTO THE VITREOUS—Suppurative iridochoroiditis is a complication of cerebrospinal meningitis associated with the development of the meningococcus in the internal membranes of the eye. The prognosis is very unfavorable. Within four or five days it almost invariably ends in suppuration and atrophy of the eye with loss of vision. Antimeningococcal serum treatment has probably reduced the frequency of this complication, but has not diminished its gravity. The resistance of meningococcal iridochoroiditis to intraspinal serum treatment should not surprise us. It is due to the same causes which are responsible for the failure of antimeningococcal serum when injected subcutaneously in cerebrospinal meningitis. A. Netter (British Journal of Children's Diseases, 1916, Vol. XIII, p. 13) has therefore been led to think that if to cure cerebrospinal meningitis it is necessary to inject serum into the spinal cavity, meningococcal iridochoroiditis should be treated by intraocular injection of serum. The patient, a girl aged six years, suffering from severe cerebrospinal meningitis complicated by suppurative arthritis of the left elbow and right knee, the anterior chamber of the right eye was more than half filled by an hypopyon. The operation consisted in the injection of several drops of Dopter's serum into the vitreous and in a puncture of the anterior chamber, which did not, however, withdraw sufficient fluid for microscopical examination. The aqueous humor rapidly resumed its transparency, the iris regained its natural color, and vision was recovered. A year later the child could clearly see every detail with the right eye. She only presents an immobility of the pupil as the result of synechiæ.—*The American Journal of Obstetrics.*

# A CASE OF MENINGOCOCCUS MENINGITIS IN THE NEWBORN, WITH INTERESTING AND UNUSUAL FEATURES \*

BY D. J. MILTON MILLER, M.D.

Atlantic City, N. J.

The patient was born February 4, 1916, after a natural labor. At 2 weeks of age it developed slight fever and two small vesicles on the lower abdomen. Simultaneously, there was a purulent conjunctivitis. This was thought to be gonorrheal by the attending physician, because of the presence of what appeared to be gonococci in the discharge. It, however, cleared up in 4 days under the use of argyrol; but the fever continued. After 2 weeks of illness, the case came under my care. The temperature then was 103°. On the abdomen and upper right thigh and groin were a number of giant vesicles or bullae, several as large as hazel-nuts. There was restlessness, but no rigidity or other nervous symptoms; no vomiting; no convulsions. For 10 days the patient had these symptoms: temperature 101-103°; bad stools; restlessness; crying and fretfulness; negative reflexes; leukocytes, 21,000 (58% of polynuclears); Culture from jugular vein negative; fever attributed to the bullae, whose contents had become clouded.

March 15, '16. Temperature, 101-102°; muscular tremors first observed and twitching of right eyelid; no Babinski, Kernig, or Brudzinski; no rigidity or bulging of fontanel. On the 16th, lumbar puncture; dry. Peculiar, wax-like condition of skin, resembling sclerema.

March 17. Second dry lumbar puncture.

March 18, 19. Rigidity, slight and general; twitching continues; no convulsions; profuse morbilliform, generalized eruption; third lumbar puncture brought about 30 minims of clear, yellow fluid, which coagulated at once into a firm, jelly-like clot. Examination was for this reason unsatisfactory; a count could not be made and cultures remained sterile.

March 20, 21. Temperature, 100-102°; child quite relaxed; fourth lumbar puncture; only 1 to 2 drops obtained, fluid coagulating in needle.

\* Read in Clinical Symposium at the Twenty-ninth Annual Meeting of the American Pediatric Society, held at White Sulphur Springs, W. Va., May 28, 29 and 30, 1917.

March 22, 24 (fourth week). Slight rigidity of neck; slight bulging of fontanel; Kernig present and also neck sign; no MacEwen sign; diagnosis of meningitis now apparent; but variety unknown; eye grounds normal (Dr. McVey); right ventricle punctured, causing free flow of slightly cloudy, yellow fluid; this contained "pus and numerous meningococci, chiefly extra-cellular," foramen of Magendi probably closed, or other canals leading from ventricles obliterated, with inspissation of fluid in spinal canal; leukocytes, 21,400; polynuclears, 60%. Sclerema-like condition of skin persists.

March 25, 26. Two withdrawals of  $\frac{1}{2}$  oz. of ventricular fluid; general condition unchanged.

March 27, 29. On the 28th, 1 oz. withdrawn from fontanel and 20 c.c. serum introduced; fontanel markedly bulging; Dr. Kolmer reported less pus and large numbers of extra-cellular meningococci. No Fehling's.

On April 1, 4, 7, 12, fontanel punctured; 1 oz. of fluid withdrawn on each occasion, and 30 c.c. of serum introduced. Dr. Kolmer reported that these fluids showed little change; protein tests positive; 90% polynuclears; numerous pus cells and extra-cellular organisms. No ill effects from punctures beyond occasional vomiting; no collapse. Clinical condition improved; less rigidity; temperature 99 to 100°.

April 14. Attempt to wash out spinal canal with saline solution through two needles at different levels failed; fluid refusing to enter canal.

April 16, 19. Fontanels punctured on two occasions and 40 c.c. of serum introduced each time. On April 20th Dr. Kolmer reported: slight reduction of Fehling's; fewer pus cells; practically no meningococci. General condition much improved: no rigidity; no twitching; patient took food well and digested it; temperature 99°, morning and evening. Patient continued to improve from the 21st to the 23d of April.

On the 24th the temperature rose to 103°; the fontanel bulged extremely; vomiting almost continuous; several convulsions; coma; 2 oz. of fluid withdrawn on two occasions, with but slight relief; death on the 26th.

*Autopsy*—Suppurative meningitis; meninges most involved in the sulci and over the base; "sections did not show presence of meningococci" (Kolmer).

To those familiar with meningitis in the newborn, this case may not appear unusual. Particularly interesting to me were the following features:

1—The onset with conjunctivitis, mistakenly regarded as gonorrheal.

2—The bullous eruption in the second week of the disease.

3—The prolonged latent period before signs of meningitis were apparent (fourth week).

4—The peculiar character of the spinal fluid. This procedure is apt to be unsatisfactory in the newborn, fluid not flowing readily from the subarachnoid space. The fluid in this case gelatinized at once. Dr. Kolmer said of this condition: "The condition of xanthochromia and massive coagulation is very unique and uncommon in meningococcus meningitis. It is found in various chronic conditions bringing about space constriction in the spinal circulation, with congestion and localized stasis of the spinal fluid. In this case the fluid was probably inspissated in the lower part of the canal, thereby producing local congestion and stasis."

5—The large number of punctures of the fontanel (10) in so young a patient, with no apparent ill effect beyond vomiting. The first two of these punctures were made into the ventricle; afterward, with greater accumulation, the needle probably entered only the subarachnoid space. The large amount of serum introduced (in all, 260 c.c), with no signs of serum disease.

6—The remarkable sclerema-like condition of the skin, persisting throughout the attack.

7—The apparent improvement in the clinical symptoms and the cerebrospinal fluid after the tenth injection of serum, with the subsequent return of active symptoms and death.

*California and Pacific Avenues.*

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A FAMILY WITH MYOTONIA, PROBABLY INTERMITTENT FORM OF THOMSEN'S DISEASE (Amer. Journ. Med. Sci., 1916, clii, p. 738). N. Toomey records eight cases, consisting of a father, aged 45 years, in whom the disease began at 14 years; a daughter, aged 18 years, in whom it began at 21½ years; a son, aged 11 years, in whom it began at 5 years; a daughter, aged 9 years, in whom it began at 6 years; a daughter, aged 6 years, in whom it began at 3 years; and three of the father's cousins, who were similarly affected.—*The British Journal of Diseases of Children.*



## PAVOR MEDICUS

BY A. J. WARING, M.D.

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Since the writer's interest in pediatrics has been aroused, he has been fortunate enough to visit some of the large Eastern clinics, and observe the methods of well-known men in the examination of children. Some individuals are blessed with a vivid and retentive memory, and with the mind of the adult are able to step back into the spiritual realm of childhood. An intelligent and sympathetic psychical return to juvenile days is always an important adjuvant to the diagnostic skill of the pediatricist.

Nothing is so difficult to examine as a frightened and noisy child. The history of its particular infirmities is transmitted to the medical man through the medium of a worried, sympathetic, and often too imaginative adult. Many mothers—as well as doctors—are unable to tell whether a baby is crying because it is hungry, colicky, or being jabbed by a pin. In addition, co-operation on the part of the child is an arduous matter. The pediatricist often gathers more information with the eye and the heart than he does with the ear and the hand.

In contradistinction to the noisy child is the quiet one who disconcerts the physician with serene eyes and is passively unresponsive to every friendly advance. Consciously or sub-consciously such children conceal the original impulses in emotional life that produce a neurotic symptom-complex. Patience, sympathy and a real knowledge of psychological diagnostic methods are vital with such children. To-day greater interest is evidenced in the "soul-life" of the young than ever before and its importance given due emphasis. We now know that the emotional life of even the comparative infant is not simple, but most complex in its developmental paths and manifestations.

Pavor Medicus, for example, is present in many children, its initial impulse along mental paths shrouded in obscurity. Injudicious threats by nurses and relatives "to send for the doctor" if the child is not good, etc., surrounded the unfortunate physician with a Mephistophelian atmosphere. To return to our original contention, however, much more significant is the behavior of the physician himself. The writer recalls one case

where the injudicious use of a thermometer on a high-strung juvenile started a bad case of *pavor nocturnus*. At this point an extract from the letter of a medical student, a memory confession correlated with the adult expression of self-analysis, is most instructive.

"As a child I recall entering the office of a physician. I will describe the incident for you as vividly as it impressed me then and as vividly as I can close my eyes and re-create the scene. The room was musty and dingy—dusty, heavy books with somber covers were carelessly spraddled on partially empty shelves. Upon a mantelpiece of dirty wood, long needing paint, were ranged several candy (?) jars. In one a small baby lay in yellow liquid, a shrunken horror, arms and legs drawn together as though the last breath (if it had breathed at all) had been one of agony. In other bottles shapeless masses were suspended that challenged a child's imagination. The doctor himself (God rest his soul) was grave in countenance, wore a heavy beard and was fumbling with some instruments that lay in front of him, an unfortunate coincidence for me. All of this I describe took just ten seconds for permanent and life-long registration. Night-terrors, habit-spasms and bed-wetting that thereafter ensued for many months were never understood by the family physician nor needless to say by my young self."

Events of this type cut deeply and with acid vigor into the emotional life of children. Such latent reasons for neurotic manifestations are usually unrecognized and invariably vital in treatment—and unfortunately not rare. By contrast, this vivid and unpleasant memory of past childhood, was recently recalled when the writer visited a successful pediatricist in a neighboring county. The medical man in question was stout, ruddy, rather bald with sparkling blue eyes—a kind of reincarnated Cheeryble brother. He smoked too much, like most medical men, but did not chew; there was no dandruff on his collar, his shoes bore all the earmarks of a matutinal polish and he wore a small flower in his buttonhole. On the table were children's books. There were several small white chairs for children scattered about. Some large potted ferns made the cool atmosphere within a pleasant contrast to the dusty heat without. His private office was as clean as his person and a model of what the average doctor's is not—a wide, cool room finished in white, with a cheerful fireplace rimmed in figured blue tiles. There was a box full

of toys in one corner. One entire wall consisted of casement windows rimmed at the bottom with green boxes of red geraniums and ferns. Two bird-cages hung above, in one a thrush and in the other a canary. The atmosphere, psychologically speaking, made one think of a sunny-tempered old maid wistful over children never born.

The writer laughingly made this comparison. The response of the pediatricist is worth while quoting: "You have paid me the one real compliment I desire. Our profession is a wholesome, vivifying one, not a gruesome, morbid one. All children approach a physician's office with taut nerves and the dread of an unknown ugly mystery. We are 'Dark Towers' of terror. Drift back through the years and recall your early medical visits! Or dental visits! A child comes to my office, for example, ready to start or run, in a condition of emotional 'strychninosis.' He hears the birds—at once there ensues the substitution of a normal, natural, and pleasurable sensation, subconsciously implanted, for an unreasoning terror. On entering my waiting-room and office, the vision of cheerful normal objects still further allays the fears of the child. In other words, my battle is half won and the patient unconsciously moulded into a somewhat receptive mood before I even begin my study of the case."

In 2 hours, 8 children from 2 to 6 years of age were skilfully and pleasantly handled. The pediatricist never failed after a few minutes to be completely "en rapport" with his little patient. The sympathetic medium was sometimes the bird-cage, the flowers, a book, a toy, or the biblical pictures on the blue tiles about the fireplace.

In the next 2 days a little was learned of this modest gentleman's philosophy. He was busy and wanted responsive children with flaccid muscles. The artificial singing bird of the photographer's studio gave him the first hint. His methods save him much nervous fatigue, actually shorten his periods of physical examination, as well as render them accurate. Though not a mental healer, he firmly believes that many illnesses are shortened and crises passed because of the faith and affection he develops in some of his patients. Though possibly some of his methods may be ridiculed, the principles of juvenile psychology displayed by this pediatricist were inherently sound. With some of the bizarre nervous disorders of childhood he is most successful. In his use of vehicles for unpleasant drugs, he exercises great

care, contending that many of the disagreeable prescriptions inflicted upon children are careless exhibitions of an imperfect knowledge of pharmacology and intensify pavor medicus. His physical examinations are models of skill and never begin with the procedures alarming to children—a study of the throat, ear, or rectum—no instruments are ever visible until a need for them arises, then they are quickly and deftly used and placed out of sight.

Can one say more? If the writer has proved his case, the medical reader can possibly derive a little food for thought from some portions of this article. Is it not true that a lack of sympathetic understanding in handling children is a just accusation against many physicians, and—shall we say—an injudicious method of increasing the clientele of the psychiatrist?

3 Perry Street, West.

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BACTERIOLOGICAL FINDINGS IN CEREBROSPINAL FLUID IN POLIOMYELITIS (Journ. Amer. Med. Assoc., 1916, lxvii, p. 1,437). J. W. Nuzum makes a further report on cultures obtained from the cerebrospinal fluid in cases of poliomyelitis. In forty-five out of fifty cases studied a minute micro-organism, germ-positive, and arranged in pairs, clumps or short chains was obtained on media composed of ascites dextrose broth, ascites broth, human ascitic fluid, and ascites broth to which a sterile piece of rabbit's kidney was added. The organism when injected into monkeys, young lambs, and rabbits, either intraperitoneally, intravenously, or intracerebrally has produced flaccid paralysis of the extremities, and in a considerable number of cases the typical histological change in the central nervous system which characterize the disease in man. Paralysis has been produced by cultures in the fifth generation and by subcultures two weeks old. The same micro-organism has been recovered in pure culture in nearly every instance from the cerebrospinal fluid and from the central nervous system of the paralysed animals at necropsy, and in sections of their spinal-cord and medulla the organism has been visible in the gray matter in pairs and short chains. The organism appears to exist in the cerebrospinal fluid for a considerable time as it was isolated in two cases fifty-nine and sixty days after the onset of the paralysis.—*The British Journal of Diseases of Children*.



# THREE CHILDREN WITH SPORADIC CRETINISM IN ONE FAMILY\*

By CHARLES HERRMAN, M.D.

New York.

This is the second time that I have had an opportunity of presenting three cases of sporadic cretinism in one family. The first series (N. Y. State Jour. Med., Aug., 1914) (Fig. 1.) consisted of two boys and a girl. The two older children, now 22



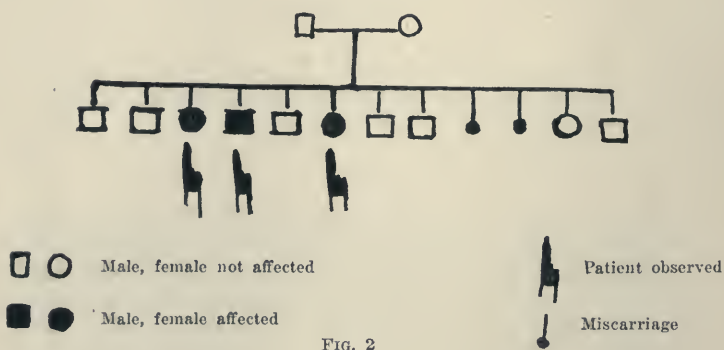
FIG. 1.—Three cretins in one family—H. G. at the age of 7; S. G. 6; B. G. 2

and 20 years old, have been under treatment for 21 and 20 years respectively. The boy, in whom treatment was begun at the age of 15 months, is normal in physical, but distinctly retarded in mental development; the girl, in whom treatment was begun at 2 months, is practically normal in both physical and mental development. The youngest child died at 3 years of bronchopneumonia.

The three patients, which I now present, are 22, 20, and 18 years of age, and have been under treatment intermittently since they were three years old. The eldest was seen by Osler in 1898, and the other two by Thayer and Smith. The parents are Austrians, healthy and not related. As far as they know no member

\* Read before the Twenty-ninth Annual Meeting of the American Pediatric Society, held at White Sulphur Springs, W. Va., May 28, 29 and 30, 1917.

of either branch of the family has had any disease of the thyroid gland, or any symptoms that would suggest disturbance of any



other of the endocrine organs. The mother has been pregnant twelve times. The diagram (Fig. 2) shows the order in which the births occurred. The children affected were born in this coun-



FIG. 3—Roentgenograph of the hand of T. T. at 22 years of age

try. In all pregnancy and labor were normal. They were breast fed from eight to sixteen months, and the first teeth appeared at one year. They were able to sit alone at  $1\frac{1}{2}$  years and to

walk at 3 years. The anterior fontanel closed at 2 years. They began to say single words at 2 years, and short sentences at 3 years. At two years of age, it was noticed that the children did not develop properly mentally and physically. At the age of three they were taken to the Johns Hopkins Hospital clinic, and were treated intermittently for several years. The irregularity in the treatment was due to the fact that they lost considerable weight and the parents became alarmed. Apparently the improvement mentally and physically was as great as is usually the case. The older girl began to menstruate at 17 years, the younger at 15



FIG. 4.—Roentgenograph of the hand of A. T. at 20 years of age

years of age. The children came under my observation March 11, 1917. Examination at that time showed that their mental and physical development was greatly retarded.

	Tillie	Abe	Jane
Age .....	22	20	18
Height .....	143.5 cm	143.5 cm.	129.5 cm.
Weight .....	98 10/16 lbs.	96 8/16 lbs.	83 4/16 lbs.
Circ. Head .....	54 cm.	56 cm.	55 cm.
Circ. Chest .....	79 cm.	69 cm.	73 cm.
Circ. Abdomen .....	79 cm.	66 cm.	76 cm.
Mental devel. (Binet)...	9 years	13 years	6 years

Tillie reached the 5 A. class in school at the age of 17 years, and Abe the 8 B. class at 20 years of age. Jane was never sent to school. The roentgenographic examination (Fig. 3, 4, 5), shows delayed ossification in all, but hardly as much as one might expect. At 18 to 20 years, union should have taken place between the bases and shafts of the phalanges, the heads and shafts of the metacarpals, and the epiphyses and shafts, at the lower end of the radius and ulna. The general appearance, (Fig. 6) of the children is that of cretins who have been under partial or inter-



FIG. 5—Roentgenograph of the hand of J. T. at 18 years of age.

mittent treatment. The faces are pale and puffy, and there is, especially in the girls an excess of adipose tissue. The hair is rather dry, and the skin cold and rough, with a tendency to scaliness. The teeth of all are carious, and the younger girl shows distinct fat pads in the supraclavicular region. The abdomen is prominent, especially in the younger girl, and constipation is marked in both girls. The examination of the thoracic and abdominal viscera presents nothing abnormal. All three children had enuresis until they were 5 or 6 years old, which then disappeared, to reappear, curiously enough, when after an interval, treatment with thyroid extract was resumed. The patients have



now been under treatment for  $2\frac{1}{2}$  months, with a combination of the extracts of the thyroid, pituitary and suprarenal glands, and have shown marked mental and physical improvement.

The symptomatology of cretinism is so well known, that I shall not discuss it, but shall make a few remarks on the etiology—consanguinity. In only five cases of fifty which have come under my observation, were the parents related. One of these was the



FIG. 6—Photograph of T. T. 22 years; A. T. 20 years,  
and J. T. 18 years

family previously mentioned, in which three children were cretins. (Fig. 1.) In these cases consanguinity in the parents, probably accentuated some defect in the ancestry, as according to Mendelian principles the children of such ancestry would receive, so to speak, a double dose. A distinct history of constitutional disease, is not more common than in other families. Tuberculosis, syphilis and malaria are usually absent. In Figs. 2 and 7, it will be seen that normal children were born between the abnormal.

Again, I have reported (N. Y. State Jour. Med., Aug., 1914), a case of cretinism in one of twins, the other being perfectly normal. It seems very unlikely that a constitutional disease in either parent would manifest its injury in only one of the twins, or that a mother so affected should have alternately a normal and an abnormal child. It seems to me that these anomalies of the so-called ductless glands, can be best explained on the basis of

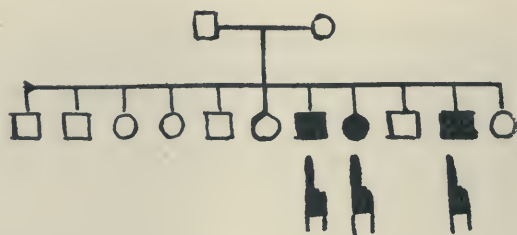


FIG. 7

heredity. There is probably some defect in the function of the endocrine system in the ancestry of these children. The defect is not necessarily of the thyroid or pronounced. Our family histories and pedigrees are usually incomplete and inaccurate, and it does not follow that because we are unable to elicit a history of such a defect, that therefore none existed.

250 West Eighty-eighth Street.

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SARCOMA OF THE PROSTATE IN A BOY AGED  $4\frac{1}{2}$  YEARS (Arch. de Méd. des Enf., 1915, xviii, p. 598.) B. de Saussine, G. Bertrand, and H. Androtsellis report the course of the disease as insidious at first, being characterized by some difficulty in micturition and pollakiuria, followed by colicky pain in the hypogastrium. About a fortnight after the onset complete retention developed. Ascending infection of the urinary passages ensued owing to repeated catheterization and death took place. The autopsy showed a tumor the size of a mandarin orange surrounding the prostatic urethra, purulent cystitis, and a slight degree of pyelonephritis. On microscopical examination the tumor was found to be a fibrosarcoma with myxomatous degeneration in places.—*The British Journal of Diseases of Children*.

## THE IMPORTANCE OF THE PRE-SCHOOL PERIOD TO THE SCHOOL CHILD \*

By JULIUS LEVY, M.D.-

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School inspection in the beginning was directed primarily to the control of contagious disease, but soon was extended to the detection and correction of physical defects and deformities that seemed to interfere with school progress and with the child being physically able to receive the benefit of the educational opportunities offered to it. The effort to eliminate hookworm disease from the school children of the South and to correct defective vision in all school children are fine illustrations of the valuable work done along these lines. Recently the relationship of cleanliness, school hygiene and the home environment to the physical and mental fitness of the school child has received more attention and is undoubtedly yielding encouraging results in the prevention of disease and in the formation of character. But it is no less true to-day that most of the thought, time and effort of the Departments of Medical Inspection is spent upon the detection and removal of existing defects and the treatment of diseased conditions that too often have already interfered with normal growth and development and, as I shall show, really could have been prevented through effective preventive child hygiene work that demands proper care and a suitable environment for every child. Have we not made the mistake of thinking that an unhealthful environment that does not seem to affect the adult is also without danger for the growing child?

The years of most rapid growth and change are the crucial periods in the life of any organism and it is in the pre-school period that the basis is laid for health and efficiency, for normal mental and physical life. The full-grown tree will withstand draught and famine but the sapling is distorted and stunted if planted in poor soil and deprived of sunlight and water. In the Survey of May 5th, a picture of a tree was shown that was fully mature, as indicated by the fruit it had borne and the number of cones, which if fully grown would have measured about six feet, but grew only to a height of six inches on account of the meager

\* Read by invitation, before the New Jersey State Association of Medical Inspection and School Hygiene, at Asbury Park, May 26, 1917.

soil into which the seed had fallen. A thorough knowledge of the processes of growth and their relation to the conditions found during school life, of the dangers to which the growing organism is exposed and the injuries it so frequently sustains, may help the school hygienist to prevent burdens from being prematurely placed upon an immature and unprepared organism and to try to prevent where now he tries to cure.

The first year, from this point of view, is the most important to the school child. At birth an infant weighs seven pounds and measures twenty inches, at the end of the first year it has tripled its weight and added fifty per cent. to its height, at the end of the second year it weighs twenty-six pounds and measures thirty-two inches, at the end of the sixth year it weighs forty-five pounds and measures forty-four inches. In the first six years then a child increases its birth weight seven-fold and doubles its height, while in the next six years a child less than doubles its weight and increases but twenty-five per cent. in height.

During this period of rapid growth the brain and heart undergo their most important development. The nutrition of the first two years of life, is especially important for the normal growth of the brain. At birth the brain of the male child weighs eleven and a half ounces, at three months seventeen and a half ounces, at six months twenty-one ounces, at one year twenty-seven ounces and at two years thirty-three ounces. The brain then has tripled its initial weight and almost completed its growth, as can be seen from the fact that in the next five years the brain gains but seven ounces in weight and in the next seven years only six ounces. While the brain at birth is one to nine of the body weight, at fourteen years it is only one to twenty-five and in adults one to forty-three. The rapid growth of the brain is shown by the rapid increase in the circumference of the skull which at birth is fourteen inches, at one year eighteen inches and at five years only twenty inches, after which time there is hardly any increase at all.

The nutrition and hygiene of the child during this period of rapid growth will determine in a large way the kind of nervous system the child will bring to school. Improper feeding during infancy will deprive the brain of its necessary nutriment, especially the minute but important elements of lecithin and phosphorus that are so essential for the normal functioning of the brain, particularly, the development of the cerebral inhibitory



centers. A child that has been suffering from malnutrition, poor hygiene or an unbalanced diet will come to school with an imperfectly organized and undeveloped nervous system, which, under the least strain, will manifest itself by quick reflexes, lack of self-control, inability to concentrate, a tendency to choreiform movements and a predisposition to convulsions, display of temper, and uncertain emotional states. In the lower grades it is this kind of a child that receives a great deal of attention from the teacher and principal—often to the detriment of the child. The best substitute for the discipline that is often applied to this type of child in school on account of inattentiveness and restlessness, bad temper and little understood emotional crises, is good nutrition and hygiene during infancy.

The development of the heart is likewise rapid and influenced by the nutrition of infancy. In the infant the heart is .89 per cent. of the body weight, while in the adult it is .52 per cent. of the body weight. Its volume at birth is 23 cubic centimeters and at seven years 100 centimeters, after which time there is barely any increase in capacity. In the first five and a half years the heart almost quadruples its weight and in the next seven years gains only one-half of its weight at five years. At birth the weight is 20.6 grams; at one and a half years, 44.5 grams; at three years, 60 grams; at five and a half years, 72 grams, and at ten years 102 grams.

The recognition of the fact that from the first to the fifth year there is a great increase in the weight and bulk of the heart, but not in its circumference, the muscles becoming thicker and stronger, is most important in the prevention of the heart defects of later life. One can readily appreciate that poor hygiene and poor nutrition at this period would interfere seriously with the normal development of this most important organ.

The heart muscles that are anemic and flabby have little of the reserve force that is necessary for the young heart to withstand the emergencies and vicissitudes of child life and to answer successfully the sudden calls for reserve power that come from shock, injury, excessive exercise and contagious disease. It is the children with such heart muscles who easily suffer from myocardial changes as a result of the toxemias of contagious disease or fatigue, the strain of work or the excito-motor stimulation of school examinations, prize contests and school work. It is particularly these hearts that need at least a week of convalescence

after any disease accompanied by temperature and toxemia so that during rest and liberal feeding, when the cells are free from bacterial toxins, the heart muscle may be replenished and regain its proper tone. Doctors and parents, I fear, have allowed the modern "speeding up" process, "the efficiency germ" even to reach down to this phase of child life and I wish to warn against the modern tendency of hastening the return to school of a child that is just recovering from a disease, no matter how mild.

The importance of safeguarding the growing heart is shown by the large number of cases of organic heart disease among school children. In New York it is estimated that two per cent. of all school children are suffering from organic heart disease. That all cases of organic heart disease in children are not due to rheumatic infection is brought out by a report made by Dr. Goodman in a series of cases studied in the Jacobi Ward in the German Hospital, in New York, where 80 per cent. of the cases were due to rheumatic infection, 16 per cent. to contagious diseases of childhood and 4 per cent. to developmental defects.

In Newark there are 70,000 school children and if this same percentage applies, and we have no reason to think it would not, there are in the schools of Newark, 1,400 children suffering from organic heart disease and probably in the State of New Jersey another 9,000. What can you do for them? You say they shall not take part in the athletic games, perhaps you arrange they should not climb stairs, or you advise their families to live on ground floors, but do you try to keep them home as long as possible after all acute diseases? Do you see that they are resting in bed while ill; that they are properly nourished? These things would help to prevent broken compensation and it is the least that the medical inspection departments can do to safeguard the child with heart disease. But the most important time to prevent heart weakness and heart disease is before the seventh year, during the period of rapid growth in weight and size, strength and form, and acute illness.

Not only will supervision of the pre-school period tend to give every child a fair chance for normal growth and development, but it will permit the early removal and correction of defects before they have had time to interfere with their mental, moral and physical development. This thought is sustained by a study of the more important common defects of school life. Cleft palate, hare-lip, club-foot and birth paralysis exist from

birth and certainly should not wait until school life begins for detection or correction. These conditions require operative interference and the best results surgically and developmentally are obtained in the first two years of life.

The element of time is even more important in defects of mental development. The school at Vineland has rendered a real service in directing attention to the question of feeble-mindedness and mental backwardness in school children and in stimulating Boards of Education and Departments of Medical Inspection to spend considerable time and money in detecting, segregating and educating this group of children. But it is even more important to realize that delayed or subnormal mental development can be recognized even before the second year of life, that it is not always due to an organic defect of the brain, that poor nutrition and disturbances in the cycle of internal secretions will explain a number of cases. I have recognized and helped by proper feeding and the administration of certain internal secretions a number of infants that otherwise would not have undergone normal mental and physical development, and would have added to the number of feeble-minded in school.

From what has been pointed out as to the rapid development of the brain in the first two years of life and its dependence for normal functional activity on the presence of certain substances as lecithin and phosphorus, it will be readily understood that the proper care, feeding and hygiene of early infancy must bear a relation to the mental development of the school child. The part the internal secretions play in early development has not been sufficiently appreciated. We know that cretinism, which is due to the absence of the thyroid substance and is cured by the early and continuous administration of thyroid extract, manifests itself by an extreme form of mental and physical retardation. One who understands the development of the normal child can detect, even before the end of the first year, evidences of mental and physical backwardness that will be favorably influenced by the administration of the thyroid and thymus gland; cases that show rapid mental development under this treatment and undoubtedly untreated would be counted among the feeble-minded in later life.

Just as a poor seed may sprout in good soil with plenty of light, air and water, so some children, though the offspring of



poor stock, can be greatly benefited by good nutrition, proper environment and the early removal of all the defects that interfere or hinder development, such as adenoids, aural catarrh and errors of refraction. It will be found that there are a large number of border-line cases of mental backwardness or feeble-mindedness whose future usefulness and development is determined by the environment of the first years of life. Active supervision in the pre-school period will reduce the number of mentally backward.

A very common defect in the school period is curvature of the spine and I can still hear (for I had the privilege of counting myself a Medical Inspector under Dr. Holmes), the teacher, the doctor and the nurse tell the children to "sit up straight." Now a child does not fail to "sit up straight" through any mental perversity or desire to be bad. Spinal defects, spinal curvatures and poor posture have their ultimate basis in muscular weakness, anemia, fatigue and poor nutrition. Of course, faulty habits of sitting and standing, badly adjusted seats and desks, excessive mental, as well as physical fatigue, tasks that call into play only a limited group of muscles, are exciting causes and should be carefully guarded against during school and home life, but if the child goes to school with plenty of calcium in its bones, with well-set-up frame and muscles, with a well oxygenated blood system and staple nervous system, it surely is less likely to be unfavorably affected by the environment of early school life, which, at its best, is unhygienic for a child under eight years of age.

The most prolific cause of various bony deformities as pigeon-breast, bow-legs, knock-knee, weak feet or flat-foot, so frequently found in school children of the poorer neighborhoods, is rickets, a disease of poor nutrition and bad hygiene that occurs usually between six months and two years. This disease not only produces these deformities, but predisposes the child to frequent and prolonged catarrhal conditions, anemia and a lowered resistance to all forms of disease. In various schools it has been estimated that from three to thirty per cent. of the children are suffering from the results of rickets. It is particularly common among the colored and Italian children; the former are thought to be influenced by the presence of syphilis in the parents, bad housing and poor diet, and the latter by prolonged nursing, poor housing, lack of fresh air and the restricted and unbalanced diets of



the Italian family. In Newark we have been actively supervising about 3,000 Italian infants, and I am glad to report that, practically speaking, rickets has been eliminated from this group.

Tuberculosis surely finds a more fertile soil in the child suffering from rickets or the results of rickets, with deformities of the chest that interfere with respiration, frequent and prolonged inflammatory conditions of the lungs and enlarged bronchial glands, anemia and gastrointestinal disturbances. The relation of rickets to deformities and impaired growth is well illustrated by the reports of the British army where defects of extremities, flat feet, malformations of chest and spine and stunted growth were responsible for 41.78 rejections, per thousand applications. In a series of 717 cripples under 16 years of age, ten per cent. were found to be due to rickets. When we think of the after effects of rickets alone and how easily it can be eliminated, we are justified in demanding that all who are interested in the physical and mental well-being of the school child should throw the full weight of their influence with the workers who are trying to guarantee to every child, from birth till it enters school, proper care, nutrition and environment. All those who have had experience with examining large numbers of children coming from parents of different economic and social standing know that there is a considerable difference in the percentage of defects in the children of school age that is determined by the difference in cleanliness, early care and environment. We are but applying the principles of democracy and its implications when we ask that these disabilities be removed and every child be given equal opportunity for growth and development.

Defective dentition helps you to swell your records of defects detected and corrected, and I dare say, has helped to popularize medical inspection of schools, and so has served a very valuable purpose, but if we believe that every carious tooth is a focus of infection to the whole system every minute it exists, that the condition of the second teeth is influenced very much by the care accorded the first, then surely we should prevent defective teeth and not be satisfied with treating them. Delayed and defective teething is influenced very definitely by syphilis, rickets, toxic conditions, deficient calcium feeding and uncleanness. The first set of teeth are completed by the third year and so only with work done during the pre-school period can we prevent the development of so many defective teeth in school children.

Many conditions of the eye begin in the pre-school period and are not detected until the child is well along in school life. Blepharitis, strabismus and defective vision begin commonly between the fourth and seventh year and are dependent often on imperfect nutrition, bad housing, poor hygiene and uncleanness, conditions that can, and should be detected and corrected early if you would prevent their injuring this most important special sense of the body.

Of twenty-two thousand school children in London, two per cent. showed some eye disease, of which three-fourths was said to be due to unwashed faces and dirty hands. In a series of 616 cases of blepharitis 300 were discovered before the child was three years of age, the majority being under six years of age. Fifteen per cent. of all eye troubles of school children are said to be due to phlyctenular conjunctivitis and keratitis, two diseases that are responsible for a great deal of blindness, begin most commonly between the fourth and sixth years of life and are found usually among children suffering from malnutrition of infancy and early childhood. It is interesting to note that seventy per cent. of the cases of a certain series began in that part of the eye that is supplied by the orbital branch of the second division of the fifth nerve, the same branch that supplies the teeth in the upper jaw and that the greatest incidence of this disease is between four and six years, usually the time of decay of the first teeth. Cure is prompt and treatment simple at an early age, supervision cheapest and most effective of all, but it consists in guaranteeing good nutrition and proper housing to all children during the pre-school period.

It probably will surprise many who associate defective vision only with later life to know that of 408 cases of hypermetropia, 103 were noted before six years of age, and that of 378 cases of hypermetropia with astigmatism, 186 cases were noted before six years of age. Neglected errors of refraction are the cause of many obscure changes in character, temperament and physical well-being, and the fact that so many of these eye conditions begin in the pre-school period would be sufficient reason for extensive supervision of this age group. Blindness is probably the most serious and saddest blight that can befall any child and when we remember that 84 per cent. of this blindness is the result of neglected ophthalmia neonatorum and that effectively organized child hygiene work can absolutely eliminate ophthalmia neona-

torum as a cause of blindness, we have an excellent illustration of the value of preventive work during the pre-school period over the methods now employed. In Newark, in two years, the number of ophthalmia cases has been reduced from thirty-three to eighteen, and we are able to report that every case in the past year has been cured.

Without special training, deaf mutes cannot speak, and the years from one to five, the years of rapid language formation, have been lost, unless this condition is detected and placed under proper treatment at this early age. In many of the poorer homes this is not likely to happen unless a City Department takes an interest in the child. The acquired forms of defective hearing are usually due to, or influenced by, contagious disease, syphilis, meningitis and post-pharyngeal obstructions. Adenoids, whether the cause of suppurative otitic conditions or the one factor that prevents prompt recovery, should be attended to before school life begins if we would prevent defective hearing, or other ill effects of naso-pharyngeal obstruction and catarrh. Probably one-half of the hearing defects of school life would be prevented if proper supervision occurred in the pre-school period.

The facts I have submitted have prompted the Newark Board of Health, through its Child Hygiene Division, to extend its supervision to the children of the pre-school period. We have only begun this work, but have already appreciated its immense value, and shortly expect to arrange for an annual or semi-annual examination of every child within our districts. In this way we believe we will conserve the results of our intensive prenatal and infant welfare work.

The rapid processes of growth during infancy and early childhood and the relationship of early nutrition and environment to the health and efficiency of the school child, give new impetus and value to preventive child hygiene work. We are granted the noble task of helping the nation to build right at the very foundation of the human structure, and as we, with care and understanding, lay a true foundation, your work, and the work of all dealing with later phases of life will be lessened and gradually eliminated.

# CLINICAL OBSERVATIONS ON POLIOMYELITIS DURING THE 1916 EPIDEMIC; PROPHYLAXIS; DESCRIPTION OF A CHARACTERISTIC SIGN\*

By HENRY HEIMAN, M.D.

New York City.

The epidemic of 1916 has given an impetus to the study of poliomyelitis in its various aspects, as it has never been studied before. The wealth of information regarding this disease, made possible by the excellent scientific work of many observers and given to the profession through the medium of numerous publications, has practically covered the entire field of this subject as far as our present knowledge extends. To summarize the work again at this time is neither necessary nor profitable. An attempt, however, to present several observations from a strictly clinical standpoint, in the hope that something might be added to our present knowledge of this important subject is the purpose of this paper. Moreover, it is my wish to present in detail a sign of diagnostic import, which has been observed before, but has never been sufficiently emphasized or put into general practical use.

It is almost impossible to improve upon Wickman's excellent classification of poliomyelitis. Even this classification, however, does not cover all the types of cases seen in the last epidemic, the largest ever known. Velum palati paralysis and bilateral ophthalmoplegia, for instance, were rare in previous epidemics, but more frequent last summer. We were formerly of the opinion that the poliomyelitis virus had a predilection for certain regions of the cerebrospinal tract, but the last epidemic has demonstrated conclusively, that not a single site in the entire tract may be exempt. Future epidemics may even bring forth paralysis of other regions, than have been observed up to the present time. It is interesting to note, that in the midst of the epidemic, it was comparatively easy to observe certain distinct clinical types of cases, occurring at about the same time, in certain localities, and presenting practically the same symptoms and signs. For instance, within several days, I had the opportunity to see four cases of velum palati paralysis; in another locality, a series of purely men-

\* Read before the Twenty-ninth Annual Meeting of the American Pediatric Society, held at White Sulphur Springs, W. Va., May 28, 29 and 30, 1917.



ingeal types of cases ; at other times the bulbar type predominated. This would seem to indicate that there are probably a great number of strains of the poliomyelitis organism varying in virulence, and having a predilection for certain regions of the cerebrospinal tract, therefore producing certain specific manifestations.

*Transmission of the Virus.* It is impossible to offer any absolute proof as to the mode of transmission in poliomyelitis. Analogy to other diseases, however, having a predilection for the cerebrospinal system, such as meningococcus meningitis, would seem to indicate that the virus is transmitted, not only by diseased, but also by healthy carriers. What I said regarding the method of transmission of meningococcus meningitis at the meeting of the Pediatric Section of the New York Academy of Medicine held April 13, 1916, probably holds true also in poliomyelitis. It is usually conceded, that Flügge's droplet infection is, in most cases, responsible for the spread of meningitis. There is reason to believe that the virus of poliomyelitis is very likely transmitted by the same means. This does not necessarily mean from patient to patient, but that, in many cases, the source of communication is a healthy or apparently healthy carrier. Therefore, just as in meningitis, in order to control properly the spread of poliomyelitis, we must devote our attention to prophylactic measures. In hospital and in private practice these measures are preeminently the gown, the cap, the hand-brush and the disinfectants. It seems however, that the most important measures, in my opinion, have not as yet been sufficiently emphasized. These are either, the wearing of a gauze mouth and nose mask, or gargling of the throat and spraying of the nose, the last two to be employed before and after visiting the patient. Moreover, if we regard the nose and throat as the principal portal of entry of the poliomyelitis germ, it would seem advisable that all persons, physicians, nurses and the public in general, during an epidemic, should pay particular attention to the cleansing of the nose and throat. We realize that we cannot completely disinfect the upper respiratory tract but inasmuch as the germ lies necessarily superficial, according to the theory of transmission, we feel justified in recommending these prophylactic measures. Let us get away from the routine, stereotyped, method of employing only the cap, gown and disinfectants and deluding ourselves that these alone are sure measures of prevention. It is reasonable to suppose that the gown serves to protect the clothing, but it cannot according to our recent theories prevent the entrance of the germ into the upper

respiratory tract. This prevention can be accomplished, in my opinion, only by thorough spraying and gargling, or by employment of a mouth and nose mask, cumbersome as this latter method may be. If as some observers claim, the gastrointestinal tract is another source of entrance of the poliomyelitis germ, the above-mentioned methods may serve a double purpose. We cannot expect to eliminate the possibility of infection through every healthy carrier by these means, but a thorough trial of these prophylactic measures, should be worthy of consideration, in the hope of diminishing the incidence, not only of this disease but of all the readily communicable diseases.

*Diagnosis.* The phase of the subject has been so often and so thoroughly discussed since the last epidemic, that I need mention but a few points, which to my mind require especial emphasis. The most transient paralysis, the slightest paresis of the extremities, the faintest suspicion of rigidity of the neck, inability to flex the head, (Draper's sign), the mildest muscle pain or cramps, occurring during an epidemic should be sufficient evidence to regard the case, at least as one of potential poliomyelitis.

In this connection let me mention a sign which I have observed in the great majority of cases of poliomyelitis, especially of the meningeal type, and which has aided me in a number of instances in making the diagnosis of this disease. This sign has been noted by various observers before, but no special diagnostic value has been attributed to it. In the *ARCHIVES OF PEDIATRICS*, July, 1909, p. 510, I mentioned that a distinct tremor of the hands and fingers occurred in several of my cases of poliomyelitis. In a discussion before the Pediatric Section of the New York Academy of Medicine, held October 12, 1916, and published in the *N. Y. Medical Record*, March 10, 1917, p. 343, I again emphasized this sign. This consists of a fine tremor of both hands elicited best by having the hands outstretched, the fingers spread apart. It is present practically always in the early stage of the disease and may persist as long as eight or ten weeks. To demonstrate this sign more clearly, it is advisable for the physician to stretch out his own fingers near those of the patient's and compare them, or to intensify the patient's tremor, by placing a sheet of paper on the dorsal surface of the outstretched hand. This tremor occurs in other infectious diseases, besides poliomyelitis, but in these is never as constant or as persistent. In meningococcus meningitis the tremor of the hands and fingers occurs fairly often but rarely persists longer than the acute stage, in poliomyeli-

tis, as mentioned above, it may continue for several months. I have found this sign marked in the great majority of poliomyelitis cases, especially those of the meningeal type. The chief disadvantages of this sign are, that it cannot be elicited in infants too young to stretch out their fingers, and in patients who are comatose. The explanation of this tremor as occurring in other diseases, probably holds good in poliomyelitis. S. A. Wilson in his monograph on "Progressive Lenticular Degeneration," in *Brain*, Vol. XXXIV, page 295, states, that "tremor is probably the result of disturbance of the efferent extra-pyramidal paths, the so-called lenticulo-rubrospinal tract. Destructive lesions of this path, remove a normal inhibiting, or rather steadying influence, which the corpus striatum exercises on the anterior horn cells. As a result of this removal, steady innervation of the anterior horn cells is impaired, and causes tremor of the extremity." It is possible that inasmuch as the virus in poliomyelitis may have its effect in any part of the cerebrospinal system, the lenticulo-rubrospinal tract may be involved. Theoretical as this explanation may appear, it is the best we can offer at the present time.

*Summary.* (1) There is not a single site in the cerebrospinal tract which may be exempt from the invasion of the poliomyelitis virus.

(2) There are probably a great number of strains of the poliomyelitis organism varying in virulence and having a predilection for certain regions of the cerebrospinal tract.

(3) The poliomyelitis virus probably gains entrance to the system through the so-called Flüge droplet infection.

(4) Healthy carriers are probably responsible for the spread of poliomyelitis in a great number of cases.

(5) A distinct tremor of the fingers, observed in a great many cases, but not sufficiently emphasized before, may be considered a characteristic sign in poliomyelitis.

(6) In addition to the time-honored prophylactic measures, the cap, gown, and disinfectants, let me strongly urge a thorough trial of either the nose and mouth mask, or the nasal spray and mouth gargle for the physicians, nurses and the public in general, before and after visiting the patient. Oral hygiene, in my opinion is far superior to manual ablutions and other so-called preventive measures, and should be considered of prime importance in prophylaxis.

## SOCIETY REPORTS

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### THE NEW YORK ACADEMY OF MEDICINE—SECTION ON PEDIATRICS

*Stated Meeting, Held October 11, 1917*

ROGER H. DENNETT, M.D., *Chairman*

#### AMAUROTIC FAMILY IDIOCY.

DR. SARA WELT-KAKELS presented this patient, a little girl who came under her observation in March, 1916, at the age of five months. The child's history was very much like that of other cases of amaurotic family idiocy. She gave no history of consanguinity, tuberculosis or syphilis. The child was normal at birth. When the child was about six months old the mother noticed that she could not hold her head or see well. At the age of eight months there was a white spot in the eyeground indicating optic nerve atrophy. There were also slight twitchings, convulsive seizures and contractures, especially of the upper extremities. The child showed all the classical symptoms of amaurotic family idiocy described by Sachs. A lumbar puncture was made and the spinal fluid examined; the results of this examination were negative. At Dr. Koplik's suggestion some of the spinal fluid from this case was injected into animals and then after some weeks the brain and spinal cord of these animals was examined, but no changes had taken place.

Discussion. DR. KOPLIK said they should feel indebted to Dr. Welt-Kakels for having shown them this rare form of amaurotic family idiocy. Contractures of the upper extremities, such as were shown in this case were very rare. He had seen over 100 cases of amaurotic family idiocy but he had not seen this form of contracture. Spasticity was not uncommon but it was uncommon to find this form of contracture in the upper extremities. It was probably a terminal contracture.

The etiology of these cases was very obscure. The majority of these children were breast fed and it was hard to account for them except on the theory that they were due to toxemia and it was for this reason that he had suggested to Dr. Welt-Kakels



the advisability of injecting the spinal fluid from this child into animals. Although the results of these experiments had been negative, Dr. Koplik said he hoped Dr. Welt-Kakels would publish them for he believed they marked a step in advance in their knowledge of this condition.

He was inclined to think with Hirsch that the condition was congenital and that possibly it was a toxemia. It was a question whether it might not be the result of a toxemia of pregnancy. That, however, was only a theory and that was why he had suggested trying to reproduce the condition in animals by the injection of the cerebrospinal fluid.

CHRONIC INTERNAL HYDROCEPHALUS. THE NEWER METHODS FOR  
ITS RECOGNITION AND TREATMENT

DR. CHARLES A. ELSBERG based this paper upon 40 cases of hydrocephalus in infants and young children which had been studied at the New York Neurological Institute and at Mount Sinai Hospital. Recent investigation had shown that the cerebrospinal fluid was more or less continually secreted; under normal conditions it left the ventricles and was absorbed from the subarachnoid space of the brain and spinal cord directly into the blood stream. He said that a number of investigators had shown that no fluid was absorbed by the walls of the ventricles, that perhaps a little entered the blood stream by the veins of Galen, but that the greater part was absorbed by the villi of the arachnoid membrane over the convexities of the brain. Considerable clinical and experimental evidence had shown that there was a circulation of the cerebrospinal fluid, and that it followed a regular course. From its source in the lateral ventricles, the fluid passed into the third and through the iter into the fourth ventricle. It left the fourth ventricle by the foramina of Magendie and Luschka, the greater part passing downward into the spinal canal on the posterior aspect of the spinal cord. He said the fluid was believed to pass upward on the anterior surface of the spinal cord and then to spread over the convexities of the hemispheres, from which regions it was, to a great extent, absorbed into the bloodstream. If this scheme of the cerebrospinal fluid circulation was accepted as the correct one, then it was easy to understand why spina difida was so apt to be complicated by hydrocephalus, and why the hydrocephalus was so apt to become aggravated under operative treatment of the spinal condition. He

stated that the hydrocephalus which complicated spina bifida was often a true obstructive hydrocephalus, the obstruction being in the spinal canal instead of in the cranium. He had been able to prove this by studies of the absorption of phenolsulphonaphthalein from the ventricles of such a patient which showed a marked retention of phenolsulphonaphthalein in the ventricles with a normal absorption of the substance from the subarachnoid space over the cerebral convexities. The very satisfactory results of puncture of the corpus callosum in several of these little patients added support to this explanation. Recent investigations had taught us that there were three different types of hydrocephalus—that due to obstruction in the aqueduct of Sylvius or in the foramina of Magendie and Luschka, that due to diminished absorption, and that due to a hypersecretion, or a combination of these. For the differentiation of these types Dandy and Blackfan and Frazier and Peet had devised a method in which phenolsulphonaphthalein was used as an indicator. A normal standard of absorption from the ventricles and subarachnoid space, and the time of normal communication between the ventricles and the subarachnoid space had been determined in this manner. After introduction into the ventricles, phenolsulphonaphthalein had appeared in the urine in from 10 to 12 minutes, and during two hours from 12 to 20 per cent. was excreted. When introduced into the subarachnoid space the dye appeared in the urine in from 6 to 8 minutes, and from 35 to 60 per cent. was excreted in 2 hours. The dye passed rapidly from the ventricles into the subarachnoid space and appeared in the spinal fluid in from one to three minutes. As an indicator, carefully neutralized sterile phenolsulphonaphthalein solution was used, and the quantity excreted in the urine was determined by readings in the colorimeter. The method was as follows: After examinations had shown that the kidneys functionated normally, a lumbar puncture was done, a cubic centimeter of fluid withdrawn, and through the same needle a cubic centimeter of sterile neutral phenolsulphonaphthalein (6 milligrams) was injected. It was important that the solution should be neutralized as the alkaline solution was irritating to the central nervous system. All of the urine secreted during the succeeding two hours was collected and examined. If less than 30 per cent. of the phenolsulphonaphthalein had been excreted, there was diminished absorption from the subarachnoid space. In the majority of cases in which the absorption

was below normal values between 2 and 14 per cent. were obtained. Four or five days after this test had been made a ventricular injection was given. In infants the ventricle was punctured through the lateral angle of the anterior fontanelle, one cubic centimeter of fluid withdrawn, and one cubic centimeter of phenolsulphonaphthalein injected.

In older children a small trephine opening was made under local or general anesthesia. After one minute a lumbar puncture was performed, a few drops of fluid allowed to escape every minute and tested. Normally the phenolsulphonaphthalein should appear in the fluid obtained by lumbar puncture within one to three minutes and should be strongly colored in three to five minutes. The fluid should be collected for two hours and tested in the usual manner. If phenolsulphonaphthalein failed to appear in the lumbar puncture fluid within ten minutes the case was one of obstructive hydrocephalus, and if the patient was under anesthesia, the proper operative interference, puncture of the corpus callosum, could be done at once through the trephine opening. The trephine opening should always be made near the median line, just behind the coronal suture, so that a callosal puncture could be made through the same opening. If these examinations showed that the normal communication between the ventricles and the subarachnoid space existed, and that there was either a normal or a subnormal absorption of fluid from the arachnoid, the next step was to determine whether the cerebrospinal fluid secretion was greater than normal. A lumbar puncture was done very day or every other day. Where the secretion of the fluid was normal, the quantity of fluid obtained at each puncture and the pressure of the fluid became steadily less after the first two or three punctures. In hypersecretion, however, the amount of the fluid obtained and the pressure under which it escaped remained constant for long periods. The occurrence of unilateral obstructive hydrocephalus might be determined by separate injections of phenolsulphonaphthalein into each lateral ventricle. The 40 cases of chronic hydrocephalus which were studied were divided as follows: obstructive hydrocephalus, 10 cases; non-obstructive hydrocephalus, 30 cases; non-obstructive with diminished absorption, 18 cases; non-obstructive with hypersecretion, 6 cases; non-obstructive with diminished absorption and hypersecretion, 6 cases. A review of the various surgical procedures devised for the relief of hydrocephalus



showed that they had all proved unsatisfactory. Based upon the modern conception of the different types of hydrocephalus, the ideal treatment of the obstructive form would be to reopen the closed iter, or the obstructed foramina, but up to the present time this could not be accomplished. For the hydrocephalus due to hypoabsorption the correct treatment would have been discovered as soon as it was possible to increase the absorbing power of the arachnoid, but this might never be possible of accomplishment. They might be more sanguine that it would soon be possible to control hydrocephalus due to hypersecretion by means of a drug that would diminish the hyperactivity of the choroid plexus. The blind, spastic infants with enormous heads, in whom there was complete optic atrophy and in whom there remained only a thin layer of brain cortex were, of course, beyond all help. The earlier the patients were sent to the surgeon, the better the chance of relief by surgical procedure after the type of hydrocephalus had been determined. In hydrocephalus due to obstruction in the aqueduct of Sylvius or the foramina of Magendie and Luschka a new channel between the ventricles and the subarachnoid space should be made by puncture of the corpus callosum. By a simple and technically easy operation, a small opening was made near the median line, the dura incised, and the cannula passed by the side of the falx cerebri, through the corpus callosum, into a lateral ventricle. The opening was enlarged by manipulation of the cannula, which was then withdrawn and the dura and scalp closed by suture. In properly selected cases, in which actual obstruction had been demonstrated, the results of this little operation were very satisfactory, and a complete cure could be effected. This was the most favorable variety of hydrocephalus for treatment up to the present time. The writer said that he had found some evidence to show that puncture of the callosum might be worth while trying in patients with obstructive hydrocephalus in whom subarachnoid absorption had been demonstrated to be below normal. In cases of hydrocephalus due to hypersecretion, a lumbar puncture should be done every few days, and the patient should be given thyroid extract in doses up to the physiological limit. From fifteen to thirty cubic centimeters of cerebrospinal fluid should be withdrawn at each puncture. The improvement in general symptoms would begin only after several months of treatment, and when the lumbar puncture demonstrated a diminished secretory activity of the choroid plexus. In hydrocephalus



due to hypersecretion a certain number of satisfactory results could be obtained by a combination of thyroid feeding and repeated lumbar punctures. Hydrocephalus due to diminished absorption was the type most favorable for treatment. Repeated lumbar punctures and thyroid feeding might be tried out but in their experience very little improvement had been seen. They had not tried to drain the fluid into any of the cavities of the body as they felt convinced that real success could not be expected from any of the methods thus far devised. In those who had had chronic hydrocephalus the size of the head would always remain larger than normal, but if there was papilledema, this would rapidly subside under successful treatment, and there would be improvement in the eyegrounds and vision. If ataxia had been of long standing, it would require years for its complete disappearance, though a marked improvement would occur within a few weeks after operation.

Discussion—DR. HENRY KOPLIK said he had been watching the progress of Dr. Elsberg's work for the past few years and had learned a great deal from it. While he felt that we owed much to Dr. Elsberg, at the same time he did not think that any great advance could be made in the treatment of hydrocephalus until we knew more of its etiology. If the choroid plexus played the part it was supposed to play in the production of hydrocephalus, it must have undergone certain changes, but we had no explanation of why some children suddenly got hydrocephalus and why others should be born with this condition. In order to get at the bottom of this question we would have to get the children that developed hydrocephalus after birth earlier than we did, and these cases should be placed in the hands of the surgeon earlier. Dr. Elsberg would like to have as many of these cases as possible. Even in the early cases it might be difficult to make a distinction between the post-natal and the ante-natal cases, for these two forms very gradually merged into each other. Many methods had been tried for the cure of these cases as Dr. Elsberg had brought out. It was very disquieting to read in the European journals of repeated lumbar punctures as a cure. He had had no such success either in the obstructive or the non-obstructive forms of hydrocephalus with repeated lumbar puncture. There was some power that continued to reproduce the fluid. On the other hand many of these cases of hydrocephalus made spontaneous recoveries and became useful members of society.

Other cases again that did not get well under operative treatment recovered at the time the skull ossified. This might be on account of the external pressure which might be sufficient to stop the process. In other cases the process seemed to stop before ossification took place, so we did not know why the process came to a stand-still. Although these spontaneous cures occurred, one should not depend upon a spontaneous cure by nature. Children that seemed to have an inflammatory process of the brain or meninges should be watched from birth. As Dr. Elsberg said, the most unsatisfactory cases to treat were those in which the hydrocephalus was due to diminished absorption and some of those shown on the screen might have been secondary to some form of inflammation. The results of puncturing the corpus callosum had not been as satisfactory as one might wish in the congenital cases.

DR. WILLIAM SHARPE said that the condition of hydrocephalus had been considered such a discouraging one that most doctors felt that it was utterly hopeless. Someone in the discussion had spoken of authorities agreeing, but there was so little known about hydrocephalus that no one could really be considered an authority; we knew little if anything as to the cause of the condition; we did know that the cerebrospinal fluid was secreted by the choroid plexus and excreted by the cortical veins, sinuses and possibly lymphatics, but we knew little of the cerebrospinal fluid itself. Personally, the speaker said he had studied and made a report upon 41 cases to the Neurological Society in February, 1917. Of this series of cases only 15 were the type of internal hydrocephalus; that was, cases in which the ventricles were blocked. He had made autopsies on each of the fatal cases (14 out of the total 41 cases operated upon at that time), and believed from his observations both at operation and at autopsy that most cases of hydrocephalus were due to a former meningitis and a blocking of the stomata of exit of the cerebrospinal fluid in the cortical veins and sinuses, and possibly lymphatics. If the foramina of Magendie and Luschka were blocked, then that was merely an incident in the diffuse process as there were still other stomata of exit in the cortical veins and sinuses which were blocked, so he felt that merely connecting the ventricles with the subarachnoid space by a callosal puncture was simply changing an internal into an external type of hydrocephalus and therefore little if any improvement could result. As Dr. Elsberg had demon-

strated in the pictures, we might have the ventricles dilated with fluid when the iter was not blocked so that merely puncturing the corpus callosum would surely not allow the fluid to get out of the cerebrospinal canal. The fluid must be given a means of exit beyond the cerebrospinal canal, that was, through the dura or into the blood stream itself. Thus, many methods had been devised to drain the ventricles when the ventricles had not been blocked and naturally the result was a failure. Dr. Sharpe said he was using a method of drainage for both the external and the internal types of hydrocephalus through the dura into the subcutaneous areas of the scalp by means of linen strands and the results had been very successful. From the cases in which this method had been employed it would seem that the cerebrospinal fluid was absorbed in the subcutaneous tissues of the scalp. In his series of 58 cases operated upon in this way there were only 17 deaths. The subject of hydrocephalus, however, was still in its infancy and any procedure, even though it gave negative results, should be given consideration.

DR. ISRAEL STRAUSS said that in discussing this paper it might be well to review the facts that had really been established. He took exception to the statement that we did not know what the spinal fluid really was. Halliburton's article in a recent number of *Brain* showed that we knew the composition of the cerebrospinal fluid and that it was secreted by the cells of the choroid plexus. From the work of Cushing and Weed we knew that a certain amount of the fluid was of periganglionic origin and was poured into the subarachnoid space, but this amount was small. From these investigators we learned that the chief pathway of absorption was through the arachnoid villi into the superior longitudinal sinus. Dr. Elsberg had spoken of the obstructive form of hydrocephalus as being due to obstruction of the aqueduct of Sylvius. In a paper by Schlapp and Gere they stated that they have examined a number of these cases and have found an obstruction in the aqueduct of Sylvius which macroscopically consisted of tubercular-like swellings of the ependyma. Under the ependyma was a layer of glia which was of the same embryonic origin as that lining the spinal canal, the substantia gelatinosa centralis. It was simply the lining of the spinal canal and when degenerative changes occurred in it we called them central gliosis syringomyelia. Both of these processes had their origin in developmental changes, going back even to prenatal development, and



it was the speaker's belief that similar changes occurred in the glia of the iter and caused the destruction described by Schlapp and Gere. The reason Dr. Elsberg derived some benefit from the procedure he had adopted in these cases might be that it allowed more fluid to get into the subarachnoid space where it might be absorbed by the villi in the longitudinal sinus. It seemed that the improvement that took place must be accounted for on physiological grounds.

Dr. Strauss said he wished to call attention to a form of hydrocephalus of infectious origin and that was internal hydrocephalus which might be due to a cerebrospinal meningitis which had led to the closure of the foramina of Magendie and Luschka. He believed that such cases should be operated upon for he did not believe that lumbar puncture would help them. He did not see why the pediatrician did not turn these cases over to the surgeon and as early as possible, so that an opening could be made in the thickened meninges over the foramina of Magendie. Here he agreed with Dr. Sharpe that when we had a meningitic process the absorption through the arachnoid villi might be very poor.

Unquestionably there were cases of hydrocephalus in which no obstruction could be demonstrated by the physician and which were followed by early blindness and optic neuritis. These were generally of infectious origin and every effort should be made to preserve the eyesight by surgical procedures.

DR. GODFREY R. PISEK said Dr. Elsberg had put the subject of hydrocephalus on a scientific basis which was something we had needed. The pediatrician had long known that the only hope for the hydrocephalic lay in surgery and hence the various older plans which Dr. Elsberg had reviewed had been tried by him but always found wanting. Many of the methods of operating had failed and some had caused death because they disturbed the heat centers, were followed by a rapid rise of temperature, and a fatal ending. There was no doubt that by finding out the type of hydrocephalus by the various tests that might now be employed we would come to some type of operation that would benefit the patient. He had been impressed for a long time with the seeming groping in the dark in our treatment of hydrocephalus. We had felt obliged to try some method of treatment and had employed lumbar puncture, and some cases had apparently been cured by lumbar puncture. Dr. Pisek said he had previously made the statement that a certain number of cases of hydrocephalus



would respond to lumbar puncture and now we would be able to decide upon the type of cases that would be helped by this procedure. Dr. Koplik had referred to the fact that apparently a certain number of cases were cured spontaneously and that this took place at the time ossification took place. He had taken the measurement of the head in many cases of hydrocephalus and had noticed that the increase in size only subsided when ossification began.

Dr. Elsberg did not speak of the mentality. It would seem that in order to get good results from the operation one should not only know the type of case but should take into consideration the mental status. To place the operation on the right plane it must be one that would improve not only the physical condition but the mental condition as well.

Dr. Elsberg, in closing, said that in the first place he excluded all the varieties of inflammatory hydrocephalus because they form an entirely different class of cases; their genesis and course is entirely different from that of hydrocephalus of the congenital type. He said nothing as to the cause of hypersecretion, obstruction or non-obstruction, but stated some of the facts brought out by recent investigations that have shown that there are three definite types of hydrocephalus: that due to obstruction, that due to diminished absorption and that due to hypersecretion. In 18 out of 40 cases diminished absorption from the arachnoid space was very marked and in such cases there is no reason for doing a puncture of the corpus callosum. The question that came up here was how we might increase the absorptive power of the subarachnoid villi and that question he would take up at another time. The fact that we could expect no benefit from a puncture of the corpus callosum in a case of hydrocephalus due to diminished absorption was the reason why we must determine whether a given case is due to obstruction or to lack of absorption. If it was due to obstruction at the time it might be benefited by puncture of the corpus callosum. When there was hypersecretion the only thing to be done was to relieve it by frequent punctures and to give thyroid which would diminish the amount of secretion. If the hydrocephalus was due to decreased absorption there was little that we could do. Dr. Elsberg said that he had devoted a great deal of time to the study of hydrocephalus as seen in the living and at autopsy and it was only to bring out

the point that they were now able to differentiate the different types of hydrocephalus that he had read this paper.

DR. L. E. LA FETRA said he had been greatly edified by the discussion as well as by the paper and he only wished to ask a question in relation to the improvement that was said sometimes to occur in cases of hydrocephalus when ossification of the skull took place. Was this improvement necessarily due to cessation in the formation of an excess of fluid and the ossification then occurring? It had seemed to him more likely that the ossification began when the excessive accumulation of fluid ceased.

#### X-RAY AND RADIUM IN THE TREATMENT OF SKIN DISEASES IN CHILDREN

DR. GEORGE M. MACKEE gave a lantern slide exhibition showing the effect of x-ray and radium upon skin diseases in infancy and childhood. He said that there were not very many skin diseases peculiar to infancy and childhood that were amenable to treatment by these agents.

One of the conditions frequently met with by the pediatrician and one in which roentgenology had given good results was favus or ringworm. This was a disease that had given a great deal of trouble in different parts of the world. It was much more difficult to treat in early life than when it occurred near the time of puberty. It had been almost eradicated in London and other European cities by the use of the x-ray, and it seemed a pity that we had not used this method more generally in the United States. Children with ringworm were not allowed to go to school, but they mingled with their fellows on the street and were therefore a menace. As a result they never received a school education. Dr. Fordyce's clinic was the only free institution in this city, so far as he knew, where this method was being employed, but every hospital and dispensary should be equipped to give this treatment; it could be given by a nurse under supervision. It was possible where there was only a single lesion to treat merely the diseased area. It was not always necessary to depilate the entire scalp. When depilation occurred care must be taken that the hairs which fell out did not become scattered and spread the affection. To avoid this, among intelligent people the lesion might be covered with zinc plaster after the treatment. Three weeks after the treatment the hair would fall out and by removing the plaster

at that time the hair would be found adherent to it. In the treatment of this condition by the x-ray, the dosage must be very accurately measured. It took a certain amount of x-ray to make the hair come out and a very little more to prevent its ever coming in again, so that the limits of the dosage were not every wide. They had treated some 300 or more cases, three different men giving the treatment, and had had no instance of permanent alopecia. It was evident that in applying the x-ray to the skull all points on the surface of the skull were not equally distant from the focus, and that the oblique rays would be less powerful than the direct rays. To overcome this discrepancy Adamson devised the method of mapping the skull into five areas and applying the x-ray to each of these areas successively. Protection was used for the face, ears and neck. It took from one-half hour to forty-five minutes to treat the entire scalp; it was not necessary, however, to treat all the areas on the same day or to apply a full depilating dose at one sitting; one might give a fractional part of the dose each day until the total dose was administered. If the correct dose was given the hair fell out in three weeks. There were a few contraindications. It could not be used in very young children, but only because they could not be kept still. A child of two or three years, however, might be treated very easily. The x-ray must not be applied to the scalp for several weeks after the application of irritating chemicals and such chemicals must not be used for several weeks after the x-ray had been employed. If the x-ray were applied at such a time a permanent depilation might result. Sometimes it was not necessary to obtain a complete depilation as the diseased hairs might fall out under very small doses and often only a partial depilation of the affected area would effect a cure.

Blastomycosis and actinomycosis were conditions that responded well to x-ray treatment.

In vascular nevi they obtained good results with radium, but not so good with the x-ray. Cavernous angiomas could be cured by the x-ray, but only by persistent treatment, and such persistent treatment was not advisable. It was probably to the Beta rays of the radium that the therapeutic results could be attributed; these were also present in the x-ray but they could not be used. The radium tube was not as satisfactory as the radium plaque because of the reticulated effect produced by the tube. The port-wine marks did not respond to the x-ray or radium. Fig-

mented nevi, likewise did not do well under treatment with these agents. Hairy nevi, on the other hand responded well to x-ray treatment, as did acne, though in the latter condition it was neither necessary nor advisable to resort to this method unless the ordinary methods failed.

Keloid occurred in infants and children usually as the result of burns and in this condition both the x-ray and radium were very efficacious, all forms of keloid being amenable to such treatment.

Of the different varieties of warts, the common wart, *verruca vulgaris*, was very amenable to treatment by the x-ray or radium, one treatment with either of these agents usually sufficing to effect a cure. The small, flat, juvenile warts did not do so well under this treatment. Plantar warts, however, which were not very satisfactorily treated by other methods responded well and he had never known a case so treated to relapse.

Sarcoma in children was curable by this method of treatment if it was attacked early enough. If a pigmented mole began to develop into a sarcoma, it could be cured provided no metastasis had occurred. Dr. MacKee showed a picture of a case of melanoma which had apparently been cured by the x-ray five years ago. The patient had one relapse and was given further x-ray treatment after which the cure appeared to be complete. He had had two or three other patients who had had no recurrence after periods of three years.

In speaking of eczema Dr. MacKee said he did not wish to be understood as advocating the use of the x-ray as a routine method of treatment, but in squamous eczema it caused the lesion to disappear and it required only small doses to produce this result. However, he used the x-ray in eczema only in obstinate cases that failed to respond to the ordinary methods of treatment.

Psoriasis occurred frequently in children and was easy to treat by means of the x-ray and radium. Chrysarobin was, however, usually satisfactory. Radium and the x-ray were both effective, but with radium one could not treat as wide an area as with the x-ray.

Lichen planus was a recalcitrant disease but it usually responded to ordinary treatment. When it was limited to small areas the x-ray or radium was indicated.

Lupus vulgaris of hypertrophic or ulcerative type yielded well to treatment with the x-ray or radium. The atrophic type was



very recalcitrant. The x-ray, if properly administered, gave very good results in tuberculous adenitis and scrofuloderma may also be treated successfully in this way.

There were a few more diseases in infants and children in which the x-ray and radium were an aid, but they were rare and would not be considered at this time.

DR. FRED M. WISE said there was little opportunity for argument in this presentation, as there was on the subject of hydrocephalus, as this was largely an exhibit of the cases "before and after" treatment. In regard to the x-ray in the treatment of tinea favosa and ringworm it might be said that if the x-ray had accomplished nothing else than to cure ringworm it would be entitled to the greatest respect as a therapeutic agent; to cure ringworm in one-half hour, when by other methods of treatment, even under the care of the best nurses and dermatologists, it took two and one-half years was certainly an achievement worthy of note.

The case of actinomycosis which Dr. MacKee showed on the screen was fortunately not dead. He was thinking of another case in a male patient. This girl was under the care of Dr. Steinke of Elizabeth, was well and had no metastases when last seen by the speaker.

With regard to nevi, all pediatricians saw these lesions and knew that some nevi got well without treatment. When they got a case of nevi at the dispensary it was their custom to ask first whether the lesion was getting larger or whether it was getting smaller. If it was not increasing in size the mother was told to let it alone and return in a year; but this did not apply to the port-wine stain. Phenol or trichloroacetic acid was sometimes as good as radium or the x-ray and perhaps better for the port-wine stain, but the best treatment was the carbondioxide snow.

Keloids, as the speaker said, were amenable only to x-ray treatment. Dr. Wise said he saw as many as a dozen of these a month, resulting from scalds and burns, and the hypertrophic scars and contractures, especially in the axilla and elbow joint causing a permanent disfigurement of the arm and difficulty in flexing the arm, could only be treated satisfactorily by x-ray and radium.

The case of warts in the elbow flexure ought to be of interest to the pediatrician. This was the ordinary lichen simplex or

lichen chronicus circumscriptus, and exanthematous eruption frequently limited to the neck, elbow and knee flexures. Later on these peculiar warty formations developed at the site of the lichen in children.

Dr. Wise stated that he had seen two cases of sarcoma cured by the x-ray. As to psoriasis, he seldom had occasion to use the x-ray in this condition. The lesions of lupus vulgaris and scrofuloderma were due to the presence of the tubercle bacilli in the skin and were difficult to cure. The Finsen light had been extensively used in Europe and the x-ray probably accomplished more good in some tuberculous lesions than all other forms of therapeutic measures hitherto advocated.

In prurigo and chronic papular urticaria the etiology was obscure, and it was difficult to cure these conditions. Occasionally divided doses of x-ray applied to the extremities would do more than any form of dietetic treatment, especially where there was a deep-seated induration of the lesions. Certain other skin diseases seen in children, such as zeroderma pigmentosum and other rare conditions had responded favorably to x-ray treatment.

DR. BOLESŁAW LAPOWSKI said he wanted to thank Dr. MacKee for what he had said in reference to the need of free clinics for the treatment of ringworm. He had had this need in his mind for some time and had laid the matter before Dr. Emerson and Dr. Emerson had approved of it and said he was ready to start a clinic, but the finances of the Health Department were such that it had to be deferred until after the war. The speaker said he had never treated cases of psoriasis with the x-ray. It was not a question of making the lesions disappear; the x-ray might do that, but relapses were likely to follow which might be very resistant to treatment.

As to the surgical diseases like sarcoma, in their treatment the x-ray might have a place. Etiologically, eczema was not a dermatoses and the logical form of treatment was constitutional and not local. In the treatment of nevi, or in fact any disease on a baby's body, it was not well to draw conclusions as to the ultimate result, for the x-ray might remove the primary lesion and something worse might follow later in life.

DR. SIDNEY V. HAAS said he merely wished to mention the fact that they had a clinic for the treatment of ringworm at the Home for Hebrew Children in this city.

DR. MACKEE said that he agreed with Dr. Lapowski's insinuations to the effect that the x-ray might produce harmful results in after years. The speaker said that all roentgenologists were acquainted with the various complications and sequellae of the x-ray and knew how they could be avoided. Radium and the x-ray should not be employed excepting by experts and they should not be used when other remedies sufficed to effect a cure. Dr. Lapowski expressed himself as opposed to the use of the x-ray and radium in eczema and psoriasis because he thought the diseases were made more rebellious thereby. The speaker had never encountered such a phenomenon, but nevertheless these agents should not be employed in such diseases unless other methods of treatment failed.

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NEPHRITIS TREATED BY DOUBLE DECAPSULATION OF THE KIDNEYS (Edin. Med. Journ., 1916, ii, p. 179). J. C. Burns describes a case in a girl aged 6 years, who was admitted to hospital on account of "swelling of the body and eyes." The indications for operation are: (1) Persistent dropsy; (2) uremia; (3) excessive albumin; (4) suppression or persistent and notable diminution of the amount of urine voided. The type of cases are acute nephritis or chronic nephritis with acute exacerbations. The best results appear to occur in chronic parenchymatous nephritis in which there is marked anasarca. In this particular case operation was justified on the following points: (1) Failure of a long course of medical treatment; (2) marked dropsy; (3) high amount of albumin; (4) diminution in the urine voided; (5) age of the patient. Operation is contraindicated in (1) cardiovascular disease; (2) patients over 50 years of age. The results of the operation on the girl are in keeping with those found in general in such operations: (1) Disappearance of dropsy; (2) increased secretion of urine; (3) great diminution in albumin. After operation there is transient anuria; then in about ten to fourteen days polyuria sets in. In about a month there are decided signs of improvement, which improvement is gradual. Whether permanent cure is established is doubtful, but there is great amelioration of the symptoms. The anesthetic employed should be ether.—*The British Journal of Diseases of Children.*

## THE PHILADELPHIA PEDIATRIC SOCIETY

*Public Meeting held June 12, 1917*

THE PRESIDENT, JOHN F. SINCLAIR, M.D., IN THE CHAIR

Dr. Samuel G. Dixon, Commissioner of Health of Pennsylvania, read a paper on "Infantile Paralysis: With Peculiar and Unexplained Observations."

In his address Dr. Dixon said: "Anterior poliomyelitis is a subject upon which much work has been done and much been said, but there is as yet a dearth of exact knowledge. I wish tonight to refresh your memory upon the active part taken by the Pennsylvania Department of Health and the recommendations which may be put forth as a result of this work. While generalizations are uncertain, we must be prepared for an epidemic condition of poliomyelitis this year, although the history of epidemics of poliomyelitis does not point to a recurrence of an epidemic or a large number of sporadic cases this season.

"The history of the disease dates back to 1838. Since this time it has extended from Norway to northern Alaska, and to most of the Southern States of this country. In 1907 the first epidemic occurred in Pennsylvania. It began in midsummer and increased in severity until November. The annual report of the Pennsylvania Department of Health for 1907 (pages 420 to 440) contained a complete study of the work done during the epidemic.

"This article is particularly interesting because it cites the fact that 'A Gram positive diplo- or tetra-coccus was recovered when the spinal fluid was poured into glucose bouillon and incubated. This Gram positive diplo- or tetra-coccus was found in all the cultures from the nose and throat. None of these cultures produced any pathogenic manifestations in experimental animals which could be compared to poliomyelitis; indeed, they seemed devoid of pathogenicity.'

"This report shows the work done with animal inoculation at this time—1907. Spinal fluid from patients with the disease was injected into the spinal canal of monkeys. No results were obtained. We are watching the Chicago workers, who, at the present time, seem sanguine of the results obtained with an organism which they have isolated.

"In the epidemic of 1907, the various stages of the disease were studied; 138 cases were reported that year. Seven counties



shared in the outbreak. In 1908, Pennsylvania suffered slightly. In 1910 the total number of cases reported was 1,112; 269 deaths occurred. We therefore looked forward to 1911 with anxiety, but only 177 cases occurred. In 1912, 267 cases were reported; in 1913, 141 cases; in 1914, 113 cases and in 1915, 162 cases. A definite decline followed by a slight rise is thus shown.

"During these years the reported cases were scattered over the state, and often occurred in extremely isolated districts, but in 1915 an epidemic of about 100 cases occurred in Erie.

"In 1916, during the first six months of the year, 22 cases appeared in Pennsylvania, scattered over 45,000 square miles. As the summer approached a severe outbreak occurred in the city of New York, an outbreak previously unequalled in the number of cases, rapidly extending into New Jersey and other states. Because of the hysteria seizing the people, the question of dealing with the psychological condition thus caused arose. While there was much evidence of direct contact as the cause of the disease, the possibility of the presence of an intermediate host or carrier could not be gainsaid. Three weeks' quarantine was adopted in New York, and 4 weeks in Philadelphia. This year, 1917, the quarantine throughout the state of Pennsylvania will be 3 weeks. As a means of prevention of the spread of the disease, railroad stations and similar places were guarded. Children under 13 years of age without a health certificate were deprived of the privilege of entering the state. All cars carrying second-hand furniture were disinfected. All transportation vehicles were thoroughly cleaned. There was considerable trouble with educators throughout the state. These people seem to think that education produces immunity to disease.

"As a result of the precautions observed above, the city of Philadelphia escaped with an incidence of 1 case of poliomyelitis to 15,000 population. Compare with this the New York figure of 27 cases per 15,000, and in Newark of 49.5 cases per 15,000. In other words, this latter figure shows that the infection was about fifty times greater than in Philadelphia. It was noticeable that the terminals of great railroads became centers of infection. By the quarantine of these centers, much was done to prevent cases coming to large cities. The people were advised to keep away from infected areas. Always in Pennsylvania cases were strictly quarantined. In some of the infected districts in New York, there was placarding without real quarantine. Everything pos-

sible was done in New York, however, to carry cases to hospitals, where, of course, good quarantine must have been enforced.

"Fortunately, our Department in 1915 was organized to take charge of epidemics and catastrophies and mobilization was quickly accomplished. Railroad stations, ferries and steamboat landings, public highways, motor and row boats, bridges and automobiles were guarded by our police.

"Certificates from Health officers in their home districts were required from traveling children. Passenger cars and freight cars carrying second-hand furniture were disinfected. Thousands of sick and infected children were excluded from our districts by these measures. We realize that it is claimed that persons who do not become immune by having the disease will become infected when exposed, but possibly so slightly as to escape recognition under ordinary circumstances. This is not satisfying when we consider that among thousands of children in institutions 100% either resist the disease entirely, or to such an extent that they never appear to be sick.

"In our laboratories in 1916, a large number of healthy monkeys were exposed to monkeys sick with the disease; none of the healthy monkeys developed paralysis. We even smeared the mucous membrane of the healthy ones with secretions from the sick monkeys, but never caused the illness to be transmitted. In explanation of the reason for the entire non-susceptibility of institutional children as compared with children in private homes, we may offer the possible explanation of food being always served cooked in institutions where much of the food in private homes is uncooked, especially among the Italians. This explanation is not nullified by the occurrence of infantile paralysis in breast-fed babies, because such infants may pick up a variety of infections from the hands and the surface of the nipples of the mothers.

"The laboratory does not yet give us the cause of poliomyelitis. The field of research has been somewhat reduced. Today we are working along lines of immunity and for the prevention of infantile paralysis. As Health Officers, we are particularly interested in the prevention of the disease or in an antitoxin that will prevent paralysis.

"Today we are in the midst of most interesting work. We are not altogether alone in our experiments. With others we are striving to produce a substance that will modify the disease commonly known as infantile paralysis. With a virus made from the

human spinal cord of a patient dead from the disease, a monkey, most susceptible of the lower animals, was injected. A young rabbit was next inoculated intraperitoneally with a saline emulsion of a portion of this monkey's spinal cord. This produced what we called poliomyelitis in the rabbit, and from this rabbit's spinal cord and from rabbits successively inoculated with the emulsion from the preceding rabbit's cord, a series of 10 rabbits was inoculated. Then, believing we had a modified condition, we reversed our work, running down the line of rabbits, each time using a stronger virus. When we reached number 4 we returned it to a monkey with a modified result. This experiment is only sketched in order that you may have some idea of the methods adopted in our study of the disease.

"We have nothing to say to the public that would give them any false hope. They must understand that we do not as yet know what produces the disease. The diagnosis depends upon keen diagnostic skill. We cannot agree with experimenters who have suggested that they can diagnose the disease on the stage of the microscope. Mistakes can often be made with the microscope and the same abnormalities of the spinal fluid may obtain in conditions other than poliomyelitis.

"To the public we would recommend a close watch upon children during the present season, and the calling of a physician upon the least suspicion, remembering that the disease has a variety of ways of presenting itself.

"It is to be hoped that the laboratory will soon produce a biologic product or therapeutic agent that will be an exact and specific remedy for this disease. The people must be educated. The importance of thorough, general cleanliness is to be emphasized. We recommend the cooking of all foods for all children. If the disease should arise, the congregation of children should be discouraged. Children should have regular feeding in moderation. Babies and small children should not be chilled at night. No animals with parasitic insect life should be allowed in the house. Adults who travel should brush off their clothes very thoroughly before coming into contact with any children. Rubbish should be destroyed. Breeding places for mosquitoes and other insects should be removed. Remember, in this connection, that bell-trap drains are often breeding places for mosquitoes. The quarantine of cases this year in Pennsylvania will probably

be 3 weeks, but whether or not a general quarantine be established will depend entirely upon the progress of the disease."

I want again to refer to the need of sending for a physician when your child gets sick. In this early stage he is much needed. The child needs absolute quiet and rest. If any deformity comes from the attack, you want the orthopedist. Parents are specially warned against resorting to charlatans, who promise the impossible. Don't permit manipulation, electricity or massage, except under the advice of a physician of high standing. Otherwise the child's sole chance of recovery may be swept away by vicious treatment.

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RENAL APLASIA AND VENAE CARDINALES RESISTENTES (Berl. klin. Woch., 1915, lii, p. 487). K. Secher reports a female child, born 6 weeks before term, admitted to hospital for wasting. Three months before death, which took place at the age of 17 months from broncho-pneumonia, a trace of albumin without formed elements appeared in the urine and persisted till death. Post-mortem, the right kidney was much enlarged, but of normal shape. The ureter was very broad and the bladder perfectly normal and symmetrical. The left kidney, ureter, and renal vessels were entirely absent. The left suprarenal was much enlarged. The genitals showed a remarkable asymmetry. The right uterine cornu and Fallopian tube were well developed, and the left uterine cornu and tube very poorly developed. Both ovaries were of equal size. The vagina was normal. Instead of one large inferior vena cava there were two vessels which united above the hilus of the right kidney. The right branch came from the medial side of the right iliac artery, crossed behind it, and ran up on the right side of the abdominal aorta. The left branch started from the medial side of the left iliac artery, passed behind it and then upwards along its side and finally crossed the aorta and united with its fellow of the opposite side. The left half of the thorax was filled by an enormously enlarged heart, the base measuring 5 cm. broad and the length being  $6\frac{1}{2}$  cm. The lower lobe of the left lung was partly atelectatic. The myocardium was hypertrophied, but otherwise there were no cardiac anomalies. Secher could not explain the cardiac hypertrophy, but suggests that the enlargement of the left suprarenal may have been associated with an increased secretion of adrenalin.—*The British Journal of Diseases of Children*.



ANNUAL JOINT MEETING  
OF THE NEW ENGLAND PEDIATRIC SOCIETY, THE PHILADELPHIA  
PEDIATRIC SOCIETY, AND THE NEW YORK SECTION OF  
THE ACADEMY OF MEDICINE.

*Held in New York City on November 8, 1917.*

The visiting physicians and the members of the Academy of Medicine assembled at the Academy at 9 a. m. They were taken in automobiles to the children's wards of Bellevue Hospital where clinics and demonstrations were given by Drs. Linnaeus D. La Fetra, Herbert B. Wilcox, Charles Hendee Smith, and Oscar M. Schloss. From 10:30 to 11:30 a. m., at the Neurological Institute a clinic was given by Dr. Charles A. Elsberg on "The Newer Methods of Diagnosis and Treatment of Hydrocephalus." Dr. Alfred S. Taylor exhibited cases and talked on "The Surgical Treatment of Birth Palsy." From 11:45 a. m. to 12:45 p. m. a clinic was given at the Babies' Hospital by Dr. L. Emmett Holt. Dr. Holt exhibited a number of post-operative cases of pyloric stenosis, and a series of cases of "brittle bones." In the afternoon from 2:30 to 3:30 a dermatologic clinic was given by Dr. George M. MacKee at the Vanderbilt Clinic. Dr. MacKee talked at length on eczema, its etiology and its treatment. From 3:30 to 4:30 Dr. Adrian Lambert gave a demonstration of Pathologic material in the laboratories of the College of Physicians and Surgeons. At 4:30 Dr. Frederick Tilney gave the last clinic which completed the purely scientific program of the day. He showed many neurological cases among children, among them several cases of Friedrich's Ataxia. Dinner was held at the Harvard Club at which there were approximately 150 men. After dinner talks on "The Pediatrician's Part in the War," were given by Drs. Herman Biggs, Richard M. Pearce, Samuel McC. Hamill, and Fritz Talbot. Roger H. Dennett, Chairman of the Section, New York Academy of Medicine presided at the dinner, and with the help of the Secretary, Dr. Oscar M. Schloss, had complete charge of all the arrangements.

## MISCELLANY

### MILK—AN INCOMPARABLE FOOD FOR CHILDREN \*

Less than a year ago there were those who wondered why the Department of Health was issuing bulletins on food economies, making studies on the best utilization of cheap food stuffs, and in other ways entering the field of nutrition and dietetics. Since that time we have learned something about the increase of tuberculosis in France and Belgium and about the spread of disease in Germany, both associated with extraordinary economies in the dietary and in all probability expressing the effect of a restricted dietary on bodily resistance to infection. In this city the increase in the price of milk has been paralleled by an increase in the number of deaths of children from diarrhoeal disease. At the present time, therefore, it is quite well recognized that there is an intimate relation between a community's food and nutrition on the one hand, and the health of its people on the other.

Among the many dietetic problems arising because of the war, none is more important than the adequate provision of cheap protein foods. There is still much misconception of the relative values of some of our common protein foods; many people, if they think about the matter at all, apparently regard protein foods as synonymous with meat and eggs. This, of course, is utterly fallacious. Milk, cereals and certain vegetables, like beans and peas, constitute important sources of protein. The first-named, milk, is especially valuable in children, for not only does it supply easily digested protein, and indispensable mineral salts, but it actually provides more energy-producing substances (fuel food) than do either meat or eggs at the same price. This is well brought out in the following comparison:

Bottled Milk at 14 cents a quart.

One cent buys 46 calories (fuel food), including 1/15 ounce of protein (building food).

Porterhouse Steak at 35 cents a pound.

One cent buys 30 calories (fuel food), including 1/15 ounce of protein (building food).

Eggs at 60 cents a dozen.

One cent buys 16 calories (fuel food), including 1/30 ounce of protein (building food).

At the above prices, one quart of milk supplies as much food as 10 ounces of porterhouse steak or 8 eggs.

\* From the Weekly Bulletin of the Department of Health, City of New York, Oct. 27, 1917.

## DEPARTMENT OF ABSTRACTS

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ORIGINAL CONDENSATIONS OF CURRENT PEDIATRIC LITERATURE  
BY THE EDITORS AND THE FOLLOWING ASSOCIATES

T. Wood Clarke.....	Utica, N. Y.	Rudolph D. Moffett...	New York City
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Raymond B. Mixsell...	Pasadena, Cal.	J. Herbert Young.....	Newton, Mass.

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HEWAT, FERGUS: ACIDOSIS WITH SPECIAL REFERENCE TO CHILDREN. (The Practitioner, May, 1917, p. 477.)

*Definition*—"Acidosis" is the term applied to a disturbance of metabolism in which certain abnormal organic acids are formed in the body, circulate in the blood and appear in the urine. "Acid intoxication," according to Bainbridge, implies in addition to acidosis the existence of toxic symptoms referable to the presence of the organic acids. Poulton, however, has shown that blood actually after mild exercise is more acid than in extreme diabetic coma, and consequently the conception of "acid intoxication" is held by Hewat to be without importance.

*Mechanism of Production*—The abnormal acids form as the result of deficient oxidation of fat, the complete metabolism of fat in the body being constantly dependent upon carbohydrate combustion. When a state of acidosis exists the ammonia resulting from proteid metabolism is not converted into urea as normally but unites with the beta-oxybutyric and diacetic acids in large quantities, constituting an alkaline antidote. There is thus, in acidosis, increase in output of ammonia nitrogen at the expense of urea nitrogen. Further defense against the abnormal acids is afforded by the fixed bases in the tissues (*e.g.*, calcium, sodium, potassium, and magnesium).

*Tests for Acetone Bodies*—Certain facts enumerated by the author are to be kept in mind; notably the invariable presence of diacetic acid in fresh urine which contains acetone, the value of a few drops of toluol as a preservative, and the possibility that a Bordeaux-red color developing upon the ferric chloride test for diacetic acid may be due to elimination in the urine of salicylate or antipyrin which the patient has been taking.

Rothera's test is recommended as a delicate combined test for both acetone and diacetic acid; 10 cubic centimeters of urine is saturated with ammonium sulphate crystals, and to this a few drops of freshly prepared sodium nitroprusside solution is added, followed by 2 or 3 cubic centimeters of concentrated ammonia. The contents of the tube are then mixed and allowed to stand for a half hour, at the expiration of which time, if the test be positive, a characteristic permanganate color develops above the layer of undissolved crystals.

Clinical conditions exclusive of diabetes in which acetone may appear in the urine are: Starvation, change of diet and surroundings, gastro-intestinal disturbances, acute septic conditions, febrile states, cachexia, constipation, rectal feeding, delayed anesthetic poisoning, toxemia of pregnancy, tetanus, and phosphorus poisoning.

Hewat reports typical cases illustrative of acidosis in children and emphasizes the truth that "cyclic vomiting" may be manifest in attacks of asthma, irritability, transient enuresis, increased urinary acidity, fat-indigestion, etc. He recalls particularly the observations made by Beesley of Edinburgh on operative cases in children. Beesley found that the mortality after chloroform anesthesia was much higher than that following administration of ether. Acetonuria associated with fatty degeneration in the liver and kidneys occurred uniformly in the fatal cases following operation under chloroform, but was not observed in any of 24 ether cases. As a result he adopted the routine practice of giving sodium bicarbonate to all children before operation, with excellent results.

*Treatment*—The two main indications are: "To stop the formation of the abnormal acids." "To neutralize the acids already present."

In a simple "bilious attack" a saline or vegetable cathartic and an enema, followed by the administration of an alkaline mixture, suffices for the medicinal treatment. The diet, however, is limited to albumin water or whey, with the addition of dextrose, until 24 to 26 hours have elapsed, whereupon oatmeal gruel may be given.

In severe cyclic vomiting prohibiting the intake of food by mouth, the lower bowel is evacuated and enemata of 5 to 10% glucose solution to which bicarbonate of soda has been added



are given as a supplement to frequent 10-grain doses of bicarbonate of soda in sweetened warm water taken by mouth. Hot fomentations are applied to the abdomen as a routine measure, and as soon as possible albumin water and dextrose are given by mouth.

GAYLORD W GRAVES.

PROESCHER, FREDERICK, SEIL, HARVEY A., AND STILLIANS, ARTHUR W.: A CONTRIBUTION TO THE ACTION OF VANADIUM WITH PARTICULAR REFERENCE TO SYPHILIS. (*The American Journal of Syphilis*, April, 1917, p. 347.)

Proescher and Seil present an exhaustive paper on the pharmacology and therapeutics of vanadium, supported by experimental data. They believe that the element played at one time a large part in plant life. The ash of the South American coals runs high in vanadium. In the acid blood of the lower maritime animals vanadium plays the rôle of oxygen carrier. Chemically it is closely related to nitrogen, phosphorus, arsenic, antimony and bismuth. It forms many salts, the most stable being from the pentoxide and tetroxide. The toxicity depends on the number of hydroxyls and the presence of the  $\text{VO}_2$  complex. Vanadium poisoning is dominated by 2 groups of symptoms, 1 the result of depression going on to acute paralysis of the respiratory center the other due to pulmonary, kidney and gastro-intestinal lesions. The chief action of vanadium is on the vascular system, an intense peripheral constriction of the vessels of the lung, spleen, kidney and intestine resulting. Some therapeutic suggestions are made aside from use in syphilis. Sodium hexavadinate may be given to man intravenously in doses of 60 milligrams. The dose for woman is 40 milligrams; 120 milligrams is the toxic dose. The urine must be watched for evidences of kidney irritation.

Stillians has used the drug in rabbit and human syphilis. His summary follows: Sodium hexavadinate is a soluble neutral salt readily sterilized in solution and therefore capable of being put up in ampules ready for injection. It causes no irritation of the mucus membrane of the mouth, and we therefore have been able to treat with it patients whose bad mouth conditions would have made mercurial treatment very difficult if not impossible. The appearance of albumin and casts in the urine, or of anorexia or slight nausea, indicate intolerance to the drug, and call for an

intermission in treatment. These symptoms may be delayed until the second day after injection, so that a 3-day interval should be allowed between doses. Our brief experiences warrant the conclusion that the salts of vanadium have a specific effect on syphilis, quickly rendering harmless the dangerous moist lesions of the first 2 stages, clearing up the clinical manifestations and favorably affecting the Wassermann reaction. Definite conclusions as to their value in comparison to the other antisyphilitics now in use will require a much longer experience.

MILLS STURTEVANT.

ABT, ISAAC A.: PNEUMOCOCCIC PERITONITIS IN INFANCY AND CHILDHOOD. (New York Medical Journal, April 28, 1917, p. 769.)

In 1911, 91 cases were recorded of pneumococcic peritonitis, most of them occurring in children under 15 years of age. The cases may be divided into 3 classes: 1—Those secondary to a pneumococcus infection in some other parts of the body. 2—Those in which the peritoneum apparently is the first point of attack. 3—Those which, owing to the rapid growth of the infection, it is impossible to decide to which of the former groups they belong. The pneumococcus may be disseminated through the blood stream, through the lymph stream and possibly by direct penetration of certain tissues or organs. This latter may occur without perceptible lesions being found in the tissues or organ involved. Thus the organism may pass not only from the pleural surface of the diaphragm into the peritoneal cavity, but also it has been assumed that they might even penetrate the intestinal walls.

The disease presents itself as a localized, circumscribed abscess and as an acute diffuse peritonitis. In the localized form the pus becomes encapsulated and the symptoms are mild, while in the profuse variety the symptoms are violent and persistent. Encapsulated pneumococcic peritonitis is characterized at the onset by the symptoms of acute peritonitis. It may begin with an acute abdominal pain, vomiting and a fetid diarrhea, usually not severe. Vomiting ceases after a few days, the fever persists but is not high, diarrhea continues. After 10 to 14 days abdominal signs again increase in severity. Pain is in the hypogastric region, with progressive fullness, dullness, fluctuation, occasional edema of the abdominal wall and fever. Unless the abscess

formation is terminated by operation or by death, spontaneous rupture of the abscess may occur through the umbilicus, through the bladder or through the vagina. The patients waste and become cachectic.

The primary diffuse pneumococcic peritonitis is characterized by severe and rapid prostration. Peritoneal facies, dry tongue, delirium, cold extremities and cyanosis may be present. Death occurs early. Diarrhea is sometimes a prominent symptom. The author reports 4 cases, all in female children.

Hartman and Temon believe that there is no medical treatment for peritonitis. Early and rapid operation is indicated. Drainage as a rule is necessary. The Fowler position, gastric lavage, and the Murphy drip are of advantage.

CHARLES E. FARR.

WELSH, D. A., AND BROWN, W. S.: THE INTENSIVE SPECIFIC TREATMENT OF EPIDEMIC CEREBROSPINAL MENINGITIS. (*Medical Journal of Australia*, August, 1916, p. 113.)

An investigation through the courtesy of the Minister of Defence and Director-General of Medical Services in Australia, largely at the Royal Prince Alfred Hospital. The series included 33 unselected cases, with 6 deaths and 27 recoveries. The argument for immediate and intensive specific treatment (antimeningitic serum) is stronger than these figures indicate, since for reasons beyond their control no such treatment was carried out in 5 of their cases. They conclude that few of the more serious infections yield to immediate, intensive and unremitting treatment more readily than epidemic meningitis. The immediate indication for treatment is to reinforce the patient against the initial infection so that the natural power of resistance is enabled to attain maximum development; by frequent lumbar punctures for relief of pressure, by injections of morphin for relief of pain and general therapeutic measures. In the technique of lumbar punctures and of serum treatment the authors advocate, unless the patient is very ill, after the third day in general some such routine; lumbar puncture and no serum on the fourth day, lumbar puncture and serum on the fifth day, lumbar puncture and no serum on the sixth day. They consider a possible cause of failure excessive repetition of anti-serum. Another interesting feature of technique is that they regard it of importance to raise the foot of the bed and remove pillows until some hours after,

when the reaction is subsiding and the patient feels relief. Since the infection is commonly supposed to be nasopharyngeal in origin, recrudescence may be a result of reinfection from this source reinfesting the cerebrospinal site. Hence local disinfectant treatment in the nasopharynx is advocated early. Spray of undiluted hydrogen peroxide, or one part of a 9 per cent. argyrol solution with nine parts of one in one thousand solution of permanganate, are those used.

JOHN B. MANNING.

PI SUNER, S. : CASE OF KALA-AZAR. (*La Medicina de los Niños*, April, 1916.)

Recent observations seem to show a steady extension of localities where kala-azar is found. The first seen in Barcelona was a child of 2 years of age born and brought up in most unsanitary surroundings. A year ago symptoms of enteritis appeared with irregular temperature, anemia and splenic enlargement. Blood examination showed reds 1,200,000, whites 1,500, polynuclears 35%, lymph cells 28. Splenic puncture revealed copious Leishmann Donovan parasites. Quinine, arsenic, and hypodermic doses of arrhenal gave no result whatever. The child died. Splenic puncture done on many stray dogs collected in the streets of Barcelona never showed the characteristic parasites.

C. D. MARTINETTI.

REDFIELD, CASPER L. : BIRTH CONTROL. (*Medicine and Surgery*, April, 1917, p. 194.)

The author takes up this subject from the point of view of the character of the children produced by old parents and young parents. He bases his deductions on study of the time of separation of the germ cells of the parents of about 1,000 men and women. In about  $\frac{1}{2}$  of these the grandparents, great-grandparents and even earlier generations were studied. One thousand cows were studied for 3 generations. Ten thousand horses and several hundred English setters were also studied. It is not stated that this is the work of the author, and no reference is given. The results of the work are not tabulated, the author merely giving as a result of this study his conviction that, "The children of old parents are superior to the children of young parents. That fact is not ordinarily observable in the children while in the childhood stage, but only in the adult stage. Neither is it always observable in a single generation. But compound



the matter by having 2 generations of children from old parents and 2 generations of children from young parents and the matter becomes clear and distinct."

Redfield regards the mother as the means to an end and advocates birth control not as a matter of convenience to the mother, but as a means of producing a better stock by eliminating the early children or the children of young parents, instead of the later children, the better product, as is recommended by most advocates of birth control.

MILLS STURTEVANT.

KAHN, I. W.: CERVICAL GLANDULAR ENLARGEMENTS IN CHILDREN. (Medical Record, April 21, 1917.)

In a case of acute inflammatory swelling of the neck, the author suggests that it be observed among which group of glands it is, if it is unilateral or bilateral, what is the possible atrium of infection and whether it is primary or secondary to some other condition.

The glands in scarlet fever and those secondary to pediculosis capitis are particularly prone to go on to suppuration. Non-suppurative cases usually subside in 4 to 10 weeks, but a small nodule is palpable for months after.

Simple chronic adenitis results from repeated attacks of the acute form or else from subacute or chronic inflammation of the skin or mucous membrane of the head and neck.

Tuberculous glands show an enlargement that is not persistent but intermittent. The process is a to and fro affair and may cover a period of months or years before suppuration appears. The slight amount of pain and tenderness becomes severe with each exacerbation.

Cervical syphilitic adenitis is quite rare. It is a multi-glandular affair with a considerable amount of swelling. The presence of other syphilitic lesions and the specific tests are diagnostic.

The only new growth that the author believes deserves attention is Hodgkin's disease. Clarke reports 40 cases in children below 10 years. Pain is rarely seen in this disease without pressure symptoms. The glands enlarge progressively and independently, are freely movable, do not suppurate or caseate, and are not usually adherent unless secondarily infected.

In acute cervical adenitis the author advises inunctions of iodine ointment or oleate of mercury or application of ichthyol

with potassium iodid, 15 grains 3 times daily, given internally to an infant of 1 or 2 years. If suppuration occurs incision and drainage are indicated.

In chronic cervical adenitis the cause should be removed if possible and syrup of iodid of iron, 10 to 15 minims, administered 3 times daily to a child of 5 years. Fowler's solution,  $2\frac{1}{2}$  minims 3 times daily may prove useful.

In tuberculous adenitis the care and upbuilding of the general health is the first indication, but the early radical treatment seems advisable in most cases. By early dissection complete removal is possible.

In the syphilitic adenitis potassium iodid, 1 to  $1\frac{1}{2}$  drams, alternating with syrup of the iodid of iron, seems to be borne well by children. Only temporary relief is afforded by any treatment in Hodgkin's disease.

CHARLES E. FARR.

NOGUCHI, HIDEYO: SPIROCHAETES. (The American Journal of Syphilis, April, 1917, p. 261.)

Noguchi begins his Harvey lecture with a list of names which a spirally shaped micro-organism may be called, Spirochaeta, Spirillum, Treponema, Spironema, Cristispira and Saprospira. Beginning with Ehrenberg's introduction of the generic term "Spirochaeta" in 1838, he takes up Schaudinn's distinction between spirachaeta and spirillum and use of "treponema" in connection with his work of 1904 and 1905. As to their classification he says, "While there are still some who consider spirochaetes as allied to bacteria, and others who regard them as of a protozoan nature, there now appear to be certain authors who are inclined to get them apart from bacteria and protozoa, and classify them apart in the domain of the protista." The author discusses the different views in this connection in some detail and gives the classifications of Gonder, Gross, Dobell, Migula and Levaditi. Under "Pathogenicity," he says that spironemata and treponemata are parasitic and some varieties cause disease in man and other animals. As a rule the former are conveyed by blood sucking insects and cause the acute febrile affections as relapsing and tic fevers while the latter are conveyed by direct contact and cause the chronic diseases as syphilis and yaws. He tabulates the different species which have been described, giving under Spirochaetae (Large

Free-Living Forms) 5 species, under Cristispirae and Saprospirae (Large Saprophytic and Commensal Forms in the Alimentary Canals of Shellfish) 10, under Spironema, 55 species, and under Treponema 7. These forms he also classifies according to habitat, and takes them up in some detail. The different species vary widely in viability. In undisturbed cultures the *Treponema pallidum* remains alive in solid culture, original method, and transplantable to a new medium for a period of one year, if kept uninterruptedly at 37 C. Noguchi tabulates the action of a number of substances which have been found to exert a dissolving or disintegrating action upon "spirochaetes" as well as upon certain protozoa. He gives the action of lugol, bichloride of mercury phenol, lysol, formalin, and potassium permanganate, giving the time taken to kill the organisms at various strengths. There is also a table showing the concentration sufficient to kill *Treponema pallidum* and concentration which no longer kills *Treponema pallidum* of 75 chemical compounds. Another table gives similar data of 20 "well-known disinfectants and chemicals." The filterability of spironema and treponema is discussed and their cultivation. In 1910-1911 the author succeeded in cultivating the *Treponema pallidum* with 2 medio, 1—a fluid medium consisting of a suitable sample of ascitic fluid or sheep serum water (Hiss) with the addition of a piece of freshly removed kidney or testicle from a normal rabbit; and 2—a solid medium consisting of a mixture of ascitic fluid and agar with the addition of a piece of fresh tissue as above described. In conclusion the author speaks of immunity and immunization. His bibliography contains 283 references.

MILLS STURTEVANT.

RYERSON, E. W.: ORTHOPEDIC TREATMENT OF POLIO-MYELITIS ANTERIOR. (Illinois Medical Journal, May, 1917, p. 299.)

In the acute stage of poliomyelitis the author believes that rest and the prevention of the deformities are the prime considerations. Massage, electricity, active and passive motion should not be used so long as there is any pain present. Immobilization, if the pain is severe, may be secured by a Bradford frame, or a plaster-of-Paris cast. The legs should be kept parallel and not spread and any tendency towards abnormality prevented by a light apparatus.

In the second stage it is advised to keep the parts warm, to encourage the careful exercise of the weakened muscle, to avoid their overuse and to prevent deformity. For this purpose light massage is helpful. The author believes that electricity is of no demonstrable value. Careful muscle training, avoiding muscle exhaustion, is imperative. Orthopedic apparatus to prevent deformity and overstrain is often necessary. Operative treatment should be avoided for at least two years.

In the third or chronic stage deformities must always be corrected if possible. Osteotomies, tenotomies and myotomies may be necessary. Transplantation of tendons or of muscles may produce brilliant results. Operations to produce stability are sometimes useful.

CHARLES E. FARR.

HOOKE, EDWARD BEECHER: PARENTAL RESPONSIBILITY. (The Journal of the American Institute of Homeopathy, April, 1917, p. 1170.)

Dr. Hooker urges that parental responsibility begins not only before birth but before the possibility of conception. Prospective parents must be free from transmissible disease or disease which may affect the offspring, and they must be prepared to take care of the child after birth. Parents must not have so many children that the care of the individual will be lessened. He discusses in detail the large part played by public health and sanitation work in providing sanitary surroundings, and recommends a system of volunteer inspectors to report infringements of the sanitary laws. He urges mothers to nurse their infants and recommends proper instruction in sex physiology.

MILLS STURTEVANT.

TAYLOR, HENRY L.: FRACTURES OF THE NECK OF THE FEMUR IN CHILDREN. (N. Y. State Journal of Medicine, November, 1917, p. 508.)

The author draws the following conclusions:

1. Fracture of the neck of the femur may occur at any age.
2. The typical fracture of the neck of the femur in children up to thirteen is a hinge fracture at the junction of the neck and shaft. This fracture is one cause of coxa vara.
3. From thirteen to sixteen, the typical injury is a fracture at or near the epiphyseal line, with marked displacement.
4. Above sixteen, the type of fracture of the femoral neck does not differ from that in adults.

HAROLD R. MIXSELL.



# ARCHIVES OF PEDIATRICS

DECEMBER, 1917

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PUBLISHED MONTHLY BY E. B. TREAT & CO., 241-243 WEST 23D STREET, NEW YORK

## EDITORIAL

### THE RESIGNATION OF DR. ROYAL STORRS HAYNES

ARCHIVES OF PEDIATRICS announces with the January number, the resignation of Dr. Royal Storrs Haynes as its editor. Dr. Haynes has served as assistant editor and editor-in-chief of ARCHIVES for the past ten years, and under his capable management, and through his editorial policy the magazine has enjoyed a unique position in its special field of pediatrics. We know that readers of ARCHIVES will receive this announcement with sincere regret. During the forthcoming year the new editor promises a continuation of the past policies of ARCHIVES, and hopes to improve in every possible way its already high standards. We sincerely trust that Dr. Haynes, as collaborator and contributor will continue to lend his valuable aid towards these ends.

## ORIGINAL COMMUNICATIONS

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### THE SKIN AND THROAT MANIFESTATIONS OF HEINE-MEDIN'S DISEASE\*

By JOSEPH G. REGAN, M.D.

Brooklyn, N. Y.

[From the Kingston Avenue Contagious Disease Hospital, Department of Health]

In the various articles and monographs upon poliomyelitis which have appeared during the last ten years, but little mention is made of the manifestations of that disease, as shown by the tongue, the throat, the buccal mucosa, and the skin. Yet, since the malady is ushered in as an acute febrile disturbance, and occurs in two phases, a systemic and meningeal, separated by a varying interval of time, it is easy to understand how the systemic phase may be mistaken for the onset of one of the acute exanthemata. It is with the purpose of describing in full these manifestations of poliomyelitis, especially in a differential way, from similar symptoms in the exanthemata, that this article is written. The observations made and the conclusions drawn were based upon over 800 cases seen during the acute stage of the malady.

*The Throat in Poliomyelitis.* An initial angina has been described by various authors, more especially by Romer<sup>1</sup>, Ed. Muller<sup>2</sup>, Draper, Peabody and Dochez<sup>3</sup>. A detailed study of the appearance of the throat has been made in our cases, and has brought out some interesting points in addition to the very valuable observations of the authors mentioned above. We have found congestion an almost constant symptom during the early acute stage of the disease. This congestion is accompanied by a certain amount of capillary ectasia, but it is never intense and involves in general only the faucial mucous membrane and the

\* Read before the Chester County Medical Society, Pennsylvania State Epileptic Hospital, November 21, 1916.

The writer wishes to express his appreciation for the co-operation of Dr. Robert J. Wilson, Director of Bureau of Hospitals, Department of Health, N. Y., and to acknowledge his thanks for the assistance rendered by the following members of the resident staff: Drs. W. T. Cannon, R. G. Laub, S. Laub, A. Eberle and F. T. Hook.

pharynx. The vail of the palate, the pillars of the fauces, and the uvula assume a diffuse deep red color. The soft palate becomes a peculiar shade of color which may be described as a deep red coloration with a distinct purplish or violaceous tinge. It is this tinge which lends to the throat, especially the soft palate, an appearance which is somewhat distinctive, although not so typical that a diagnosis could be based upon its presence. Insomuch as the hard palate retains its normal pinkish blue coloration, it is not infrequent to see three zones of color, the deep red of the faucial mucous membrane, the red admixed with a purplish tinge of the soft palate, and the pinkish blue of the hard palate and roof of the mouth. The depth of coloration of the soft palate seems to bear some relation to the respiratory symptoms in that the more marked the involvement of the respiratory muscles, the deeper the hue of purple that it assumes. However, this symptom is encountered independent of any paralysis of the muscles of respiration. Thus it is present even in the early preparalytic stage; but on the other hand even at this time rapid and shallow breathing without paralysis is rather frequently encountered. The deep color of the soft palate gradually disappears, and by the 3rd or 6th week has been replaced by a reddish-yellow coloration due to anemia. The faucial mucosa likewise gradually loses its deep red color and changes to the normal or to an anemic appearance. So also does the pharynx, but at a somewhat later period. The pharyngeal tonsils are especially apt to remain in a state of inflammation for a prolonged but variable length of time, depending on the individual case.

The punctiform rash and the congestive condition of the surface blood vessels of the soft palate, frequently seen in scarlatina, are usually lacking in poliomyelitis. In this latter disease the congestion does not extend beyond the faucial mucosa and uvula, while in the former it also spreads upwards over the soft palate, and gives the entire throat a bright red coloration. The appearance of the throat in measles, and in diphtheria after the exudate has disappeared is much more like that of poliomyelitis, than is the throat of scarlet fever. But even here the hue of the mucous membrane of the soft palate is usually of a less distinct purplish tinge. The resemblance may be very close however, because this distinctive tinge of color in poliomyelitis is subject to considerable variations in degree. Only rarely have we noted an anemic con-

dition of the throat in the acute stage, and then almost exclusively in the bulbar types of the disease, where the child's condition was very poor, and the prognosis as to life hopeless.

Inflammation of the tonsils of a mild degree, seems to be quite constant in Heine-Medin's Disease, but it is almost never of a severe character. The tonsils are usually slightly enlarged, and the tonsillar crypts somewhat more prominent than normal. Rarely is the inflammation sufficiently intense as to be accompanied by the formation of a follicular exudate. We have nevertheless observed this latter condition in 3 of our 800 cases. In these instances the follicles were not very numerous; they remained discrete, and were of a yellowish and grayish white color. Cultures were negative for Klebs-Loeffler bacilli. In no instances has any true membrane formation been encountered, and therefore there is little possibility of confusion with diphtheria, in this respect.

The uvula has presented some unusual appearances in some of our patients. It has appeared to be often considerably below the normal size, especially as regards the length of the process. It was not rare to find a uvula only one half the usual size, even in some cases being almost rudimentary.

The buccal mucous membrane retains a great deal of its normal coloration of pink, even in the acute stage of poliomyelitis. It may vary from pink to a pinkish-red but is rarely as deeply red a color as that seen in measles and scarlet fever. We have noted upon its surface in very few cases, probably a total of 5 in all, a pin head, macular rash of a red color, the lesions being always discrete and non-elevated but very much like Koplik's spots in their early stage. The resemblance has been so close indeed that in the beginning of the epidemic several cases of poliomyelitis were isolated as possible cases of measles. But further observation for a period of three or four days failed to show the changes which Koplik's spots undergo in their maturation, namely, the formation of a vesicular center, its definite elevation above the surface of the mucous membrane and the coalescence and grouping of the individual spots. On the contrary, after remaining stationary for a few days, these suspicious macular spots would fade and disappear, and moreover, the catarrhal symptoms were much less marked than in measles.



This brings up the point that secretions and discharges from the mucous membranes are not common in poliomyelitis, in fact one may say that while the causative agent of the disease usually excites an inflammatory reaction of mucous membranes, associated with increased blood supply. This inflammation rarely goes on to the stage of exudation. So that while we often have conjunctival injection and redness of the nasal mucosa, as well as of the upper portion of the drum membrane, we find it unusual to have a discharge from any of these mucous surfaces. An exception to this is occasionally observed in the case of the eyes, for we have noticed a slight and transient muco-purulent secretion from the conjunctiva. This has been most constant in bulbar cases.

Remembering these facts one will not be likely to confuse measles, scarlet fever, or diphtheria with the early stages of poliomyelitis, nor to suspect the presence of a mixed infection in cases where we are only dealing with a straight case of the latter disease. Naturally it is the additional presence or the absence of an infection, (measles, scarlet fever, diphtheria, etc.), besides poliomyelitis, rather than a differential diagnosis between the latter and any of the former, that is most apt to come up for decision.

*The Tongue.* The tongue presents an almost constant picture in the early stages of the disease, and one that can be classed under the symptomatology. It is very heavily covered with a grayish or yellowish white coating, usually moist, with the edges and the tip devoid of any covering, and appearing of a slightly deeper red than normal, and sometimes of a reddish purple coloration. When the coating is removed, the papillae are not found to be especially prominent and enlarged, although they may be increased in size slightly above the normal. So that the tongue of poliomyelitis presents a different aspect to the tongue of scarlet fever, in that it is not such a vivid red color, that its coating persists for a longer period and is often thicker and that the papillae are not nearly so prominently enlarged nor so deeply colored. Quite frequently the tongue also possesses another characteristic, in that the yellowish or white covering of its surface is absent in some places, and here the mucous membrane shows through. These areas are usually oval or irregular and very often geographical in their outline. (R. Laub, of the resident staff, fre-

quently has encountered similar cases.) The appearance of the tongue in the acute stage of epidemic meningitis is very similar to that just described as occurring in poliomyelitis. In both cases the most characteristic point is probably the very thick yellowish white coating which occupies the entire anterior and middle part of the dorsum.

*Gingivitis* occurs in poliomyelitis although it is not nearly so common as in measles. We should say that about 10 per cent. of our cases showed gingivitis of some degree. It is of a similar character to that of measles, but is rarely as marked, and the epithelial debris covering the gum is usually a light coating, rather than a thick, heavy deposit. It disappears usually from the fourth to the seventh day of the disease.

*Rashes.* Several varieties of rashes have been briefly mentioned as occurring in poliomyelitis. Ed Muller<sup>4</sup> in a masterly and thorough study of 100 cases of the disease mentions various types such as: vesicular, measly, and scarlatiniform erythemas, with herpes present in 4 cases. In the Report of the N. Y. Epidemic of 1907<sup>5</sup>, cutaneous eruptions were described in 61 cases. Draper, Peabody and Dochez<sup>6</sup>, in a careful and detailed study of 183 cases, state that they have not seen the cutaneous eruption which is described as part of the disease: "There have been several cases having more or less extensive erythematous rashes, about the neck and chest, but these have looked like prickly heat and had no constant distribution." But later on, in the study of their individual cases<sup>7</sup> they mention this type of rash several times, as "resembling prickly heat?" The question mark would possibly seem to imply that the authors were inclined to think that the rash was something other than prickly heat. Manning and Frauenthal<sup>8</sup> in their book upon poliomyelitis, mention and describe more fully than previous writers, the various types of rash, stating that more than 10 per cent. of the cases of poliomyelitis are accompanied by a rash, most commonly of a measly-like variety, often indeed, leading to an incorrect diagnosis of measles. Romer<sup>9</sup> cites a case in which a scarlatiniform rash appeared on the chest and arms in the seventh week of the disease. The rash reappeared eight days later, this time upon the thighs. The case was not accompanied by any evidence of sore throat.

During the 1908 epidemic, Brown<sup>10</sup>, of Toronto, reported a skin eruption in 6 consecutive cases of poliomyelitis. It was of

a papular and vesicular character and was generalized over the entire body. He regarded it as typical. Armstrong<sup>11</sup>, of Wisconsin, during the same epidemic noted "a small pimply rash about the trunk and neck" in 1 case and Anderson<sup>12</sup>, of Nebraska, reported a rash often seen which was characterized by rose-colored spots from  $\frac{1}{2}$  to 2 inches in diameter; these spots faded to brown and disappeared.

From the study of the cases coming under our observation we feel that rashes occur so frequently in poliomyelitis that they must be classed under the symptomatology of the disease, and must not be regarded merely as coincidental. We do not mean to imply by this statement that a diagnosis can be based upon their presence in any particular case, but it seems to us, as it does to Frauenthal and Manning, that their existence should be recognized, so that confusion with the acute exanthemata will be less likely to occur. In 1017 cases of poliomyelitis terminated rashes were present 114 times, approximately in 10 per cent. of the patients. This, of course, is merely a rough estimate because, no doubt, in a number of instances the rashes had already faded by the time the cases were admitted. On the other hand, it was not uncommon to encounter 2 rashes at different periods of time in the same patient, 1 during the first week or two of the disease, the other during convalescence.

In order to show the types of rashes, the distribution, the time of occurrence, etc., table 1 has been constructed. It is made up of 30 patients selected indiscriminately, and gives a fairly accurate idea of the important points connected with the eruption.

#### OBSERVATIONS AND CONCLUSIONS FROM THIS SERIES OF 30 CASES.

*Age.* The ages at which the rashes occurred varied between 6 months and 18 years. 80 per cent. of the cases were 3 years or under.

*Time of Appearance.* It is impossible to state how early the rashes appeared in the greater proportion of the cases, but judging by the fact that they were beginning to fade in some of the patients admitted on the fourth and fifth day of the disease, it seems probable that the rash may appear as early as the second day. On the other hand they may appear as late as the fifth or sixth week. In over 80 per cent., however, rashes appeared in the first week.

*Recoveries and Deaths.* Deaths occurred in 5 of the series of 30 cases and recoveries in 25. This gives a death rate of  $16\frac{2}{3}$  per cent. This is considerably below the average death rate of the epidemic, which has been about 26 per cent.

*Duration.* By studying the cases developing rashes while in the hospital, it was found that their duration might vary between 2 and 8 days, the average being 4 days. Cases with intercostal paralysis, and a jerky spasmodic action of the diaphragm may often have a more or less faded rash persistently present for a period of several weeks.

*Distribution.* The following distribution occurred:

On the chest.....	30 times in 32 rashes
On the neck.....	25 times in 32 rashes
On the back.....	17 times in 32 rashes
On the abdomen.....	14 times in 32 rashes
On the arms.....	9 times in 32 rashes
On the legs.....	2 times in 32 rashes

The rash therefore appears in about 90 per cent. of the cases on the neck and chest, then next in frequency upon the back, abdomen and face, in the order named. It is present with least frequency upon the extremities, especially the lower. The cutaneous eruption is mentioned as being present 9 times upon the upper extremities but this does not mean the forearm was involved; on the contrary, the forearm rarely showed any evidence of eruption. This tendency to remain localized to the trunk of the body, is useful in differential diagnosis from scarlet fever, when the type is scarletinform.

*Frequency in Different Types of the Disease.* 24 of the cases were myelitic (11 myelitic only, 13 myelitic and some other type). 11 of the cases presented marked hydrocephalic symptoms. 8 of the cases were meningitic (3 meningitic only, 5 meningitic and some other type). 3 of the cases were bulbar (1 bulbar only, 2 bulbar and some other type). 5 of the cases showed other cranial nerve involvement.

This frequency would lead one to think that bulbar cases are rather infrequently accompanied by a rash, especially those with bulbar symptoms at the onset. Of the 3 instances in this series, only 1 of them was primarily bulbar. The other 2 represented



cases developing symptoms during the subacute stage of the disease. This latter type not unusually has a concomitant rash.

In contrast to the bulbar cases, the meningitic types of the disease are very frequently accompanied by an eruption for 10 per cent. of the series were of this type purely, and this is a percentage high above the usual ratio of meningitic to myelitic cases.

*Types of Rashes.* The 32 rashes were composed of the following varieties: 18 were pin-head papular. 6 were pin-head papular and scarlatiniform. 4 were pin-head papular and macular. 1 was maculo-papular. 3 were scarlatiniform, one of these being hemorrhagic.

Evidently the pin-head papular rash is the most frequent variety in this series. We are inclined to think that this rash is generally preceded by the scarlatiniform variety. From the few cases we have seen, from the beginning of the rash, the scarlatiniform variety lasts 12 to 24 hours, and then the punctate non-elevated lesions begin to be replaced by a pin-point to a pin-head papules situated upon an erythematous base, so that the skin which had been smooth to the touch 24 hours previously, becomes rough and uneven. Not infrequently the papules are surmounted by pustules in places. About the third day the erythematous base of the papule fades and the papule turns a brownish color and begins to diminish in size, the lesions drying up. This period during which the rash is disappearing persists as a rule for three or four days. In respiratory cases where the intercostals are paralyzed, and where there is paresis of the abdominal muscles it is apt to persist for a longer period, and may extend to 1 or 2 weeks, and such cases often have a rough skin for long intervals due either to incomplete disappearance of the rash or possibly to successive outbreaks of a fresh eruption.

A pure scarlatiniform rash occurring in the convalescent stage of poliomyelitis, especially if the throat still remains congested, is often difficult to distinguish definitely from true scarlet fever. However, the tongue remains negative, the temperature little if at all elevated, and lasts not more than 24 hours, and most important the child is not sick, very often expressing the desire to play around. Moreover, while desquamation follows both types of eruptions, as a rule it does not involve to any extent the palms of the hands, and the soles of the feet in poliomyelitis. There is

little or no danger of confusing the maculo-papular type of rash with measles, as catarrhal symptoms and Koplik's spots are lacking in the former and, moreover, we have found this variety rather rare, differing in this respect with the findings of Frauenthal and Manning.

*Nature of the Rashes.* The pin-point or pin-head papular rash would seem to resemble most closely that variety of miliaria, which is called miliaria papulosa, and which is one of the forms of lichen tropicus. Miliaria occurs most frequently in hot weather, and seems to have for its most important etiological factor high atmospheric temperature and sweating, according to Stelwagon<sup>13</sup>, Jackson<sup>14</sup> and others. In the early stage of poliomyelitis, sweating is also a very prominent and frequent symptom and to this may be attributed some of the miliaria-like eruptions seen during the very acute period of the disease. But it seems very improbable that all the eruptions of poliomyelitis are caused by this one etiological factor. The intestinal tract is commonly affected to a more or less marked extent, not only in the early paralytic stage, but also later on in early convalescence. Intestinal complications such as enteritis and enterocolitis are so apt to originate at any time that we are strongly inclined to think that an intestinal toxemia may account for a considerable number of the rashes encountered. This toxemia must be of a particular kind, and is very apt to be accompanied by a cutaneous manifestation. Probably there are other etiological factors concerned in the production of these rashes, but even if this is not the case, we cannot but consider them symptomatic of the disease, since their origin is probably intimately connected with two very frequent symptoms, namely sweating and evidences of infection of the intestinal tract. It is interesting to note how close a resemblance there is between the cutaneous manifestations of miliary fever (*suette miliary* of the French) and the eruptions and desquamations of poliomyelitis. The diseases also, while not identical, have many points in common.

*Occurrence of Herpes.* We have failed to observe any true examples of herpes in any of our cases. We have seen repeatedly, large flat blebs, only partially distended with serum, appear on part of the chest, the neck, on the upper arms, or the face, which would, in the course of 24 hours, lose the protective cutaneous covering

and leave an oval, reddened and moist abraided surface, which quickly healed. The lesions appeared in relatively few numbers, not more than 2 or 3 at a time, and as a rule in different parts of the body. They differed from the classical picture which herpes presents in that the vesicles occurred singly and not in groups, and in that the individual lesions were much larger, and were situated more superficially. Moreover, the distribution was very irregular, and did not appear to follow any particular nerve. The lesions resemble most closely those of acute pemphigus, but differ in certain respects; they are not so large, contain only a small amount of serum, and on rupture never form crusts.

*Desquamation in Poliomyelitis.* Desquamation is only rarely mentioned in the literature of Heine-Medin's disease. In only one instance could any observation upon this point be found. Romer cites a case in which a scarlatiniform eruption was followed by peeling. He writes thus: "Definite peeling was seen in small flakes upon the parts affected." Yet careful observation of the cases in the epidemic of 1916, has compelled us to conclude that it is undoubtedly very frequent and often very profuse. The typical type of desquamation is one that resembles that of measles in some respects, while in others it is allied to that of scarlet fever. Thus we find it often furfuraceous in one part of the body, and lamellar in another. Rarely it may involve the palms of the hands and the soles of the feet, and we have seen one instance in which it would be impossible to draw a line of distinction between the desquamation of poliomyelitis and that of scarlet fever. But this is evidently unusual and the palms and soles are only occasionally concerned, and rarely to the extent that occurs in the latter disease. The desquamatory process is apt to be most profuse around the neck, the chest, upper abdomen and back, than elsewhere, corresponding in this way to the most prominent distribution of the rash. As a rule it begins as soon as the rash fades, being first noticeable on the face, neck, and upper chest, and thence spreading successively to the other portions of the body. It usually persists for 3 or 4 weeks to a more or less marked degree. Often the pin-head or pin-point papule is the starting point for the process of peeling, for as this fades, it opens up in its center forming a minute circular break in the skin. As this occurs simultaneously in neighboring papules,



the result of the fusion of a considerable number of these breaks in the skin is a lamellar type of desquamation like that of scarlet fever.

Besides true desquamation occurring after rashes, there also appears to be a "cutaneous exfoliation" of the skin in a large number of patients convalescent from poliomyelitis either as a result of some trophic change or the loss of the fullness of the subcutaneous tissues, with subsequent shrinking and drying of the overlying derma. In convalescent cases, 6 to 8 months after the onset, the skin of the paralyzed part sometimes assumes a parchment or goose skin appearance, more especially if the bathing of the affected parts has been neglected.

#### CASE REPORTS.

1. *Scarlatiniform Rash Developing in Convalescence.* Case No 2768, P. H., 3 years, admitted to hospital on August 16th, 1916, with a history of illness for 5 days previous. Patient well nourished and developed. Acutely and severely ill. Light stupor, restless when disturbed; eyes are equal; pupils dilated but react to light, cannot be made to react to accommodation. Kernig's sign positive, more so on the left side. Macewen's sign is also positive. Knee-jerks are present but sluggish, likewise the plantar reflexes. Paralysis is flaccid in type and involves the right thigh muscles and the muscles of the neck. Skin is clean. Heart is arrhythmic and the sounds are rather weak; the pulse is irregular and of very poor volume. The respirations are very shallow, irregular and jerky. August 18th—Lumbar puncture—20 cu.cms. of clear fluid under moderate pressure.

September 25th—Since August 18th the child's condition has greatly improved; the meningeal and hydrocephalic symptoms have disappeared, the breathing is almost normal. Today at 3 p. m. a punctate erythematous rash appeared on the neck, trunk, and upper part of the extremities. Throat is slightly congested, but the congestion is limited to the faucial mucosa, and may have been present since the onset of poliomyelitis. The child does not complain of feeling sick, and desires to play with the other children. Temperature at noon was 102°, and by midnight was 101°, and at 8 a. m., September 26th was 98.4°. September 26th. Throat the same, slight congestion limited to faucial mucosa, no involvement of the soft palate. Rash fading rapidly. October



12th—Patient discharged. Showed no signs of desquamation on the hands and feet, and only a slight branny desquamation on body. No secondary rashes appeared amongst the other children exposed to this case.

2. *Two Rashes at an Interval of 17 Days in the Same Patient.* Case No. 1555, T. S., 2 years, admitted July 5th, 1917. General condition is good, well developed and nourished. Neck shows anterior-posterior rigidity. Mentality is good, but patient is irritable and restless. Respirations are abdominal and irregular, no costal movement. Paralysis:—Upper and lower extremities are partially paralyzed, also the intercostal muscles. Knee-jerks are present. Macewen's sign is moderate. Rash of a brownish character on the chest, abdomen, back and neck; the lesions being unelevated. Desquamatory process has started on the hands and arms, also on the cheeks. The buccal mucosa is rather deeply colored. The throat is somewhat congested, the soft palate assuming a deep red color with a purplish tinge. Tongue is heavily coated, with a yellowish white covering; and is of a deep red color at the margins and tip. July 21st—Slight improvement in extremities. Patient brighter. Respiration improved. Rigidity of the neck is still present. July 22nd—Small pin-point to pin-head papular rash on chest and neck. Very marked desquamation upon body. Patient was discharged August 26th.

3. *Miliaria-like Rash Appearing During Convalescence.* Case No. 2761, J. V., 18 months, admitted August 17th, 1916. Discharged October 9th, 1916. Physical examination on admission:—Fairly well developed and nourished. Acutely but not desperately ill. Mentality bright. Macewen's sign is absent. No rigidity of the neck or spine. Pupils react normally to light, and probably to accommodation. Respiration is costo-abdominal and normal in type. Knee-jerks are present, also plantar reflexes. Kernig's sign is absent. Hyperesthesia and polyneuritis are absent. Both lower extremities are weak, and the child stumbles and falls when walking. September 16th—Temperature 99°, pulse 114, respiration 28. September 17th—Rash appeared over the neck and body also the upper part of the extremities. It is composed of minute miliary, slightly elevated lesions upon an erythematous base, temperature, 101°, pulse 130, respiration 30. September 18th, 8 a. m.—Temperature 99°, pulse 118, respiration 28. September 19th—Rash fading, color has changed. The lesions are

now brownish, slightly elevated, and rough. The red areola has disappeared completely, temperature, 99°, pulse 114, respiration 28.

4. *Miliaria-like Eruption Developing in the Late Acute Stage and Persisting Still on Discharge.* D. G., 2 years, admitted August 16th, discharged October 7th. Physical examination on admission:—Well developed and nourished child. Acutely ill. Mentality is bright. Macewen's sign absent. Flaccidity of neck and spine. Pupils are equal and react to light. Respiration is irregular, mostly costal, having a peculiar jerky movement. Knee-jerks are absent; plantar reflexes present. Abdominal reflexes absent. Kernig is positive on both sides. No ankle clonus nor Babinski. Slight polyneuritis over both lower extremities. Skin is clean. Glands are not enlarged. Buccal mucosa and throat are slightly congested. Heart is a little rapid, but regular in rate and rhythm. No murmurs. Lungs are negative, no râles. Liver is not palpable. September 2nd:—Profuse sweating, especially of the face. September 3rd:—Pupils are still dilated. September 22nd:—Still has severe attacks of perspiration. October 7th:—On discharge:—Child has improved little since admission. The back, both uppers, and both lower extremities are still paralyzed. There is flaccidity of the muscles and some atrophy. There is still some residual paralysis of the intercostal and abdominal muscles. The result of this latter involvement is a constriction of the upper portion of the chest, and a flaring of the lower portion. The breathing is entirely abdominal in type, there being no costal movement present at all. There is a diffuse roughness of the skin of the body consisting of brownish elevated pin-point to pin-head papules, of generalized distribution over the entire trunk. The pupils are still markedly dilated, but react sluggishly to light. The child has a soft indistinct cough.

#### SUMMARY

1. Congestion of the throat is an almost constant symptom of poliomyelitis during the early acute stage of the malady. It is as a rule limited to the faucial mucosa, and the pharynx, while the soft palate assumes a deep red color, and often in addition a distinct violaceous tinge, but the surface blood vessels of its mucosa are not usually congested to any very noticeable extent. This violaceous tinge which the soft palate assumes varies in degree, and while not by any means typical, it is somewhat dis-

tinctive of poliomyelitis, when it is marked. The capillary congestion of the mucous membrane of the throat in scarlatina is more intense than it is in Heine-Medin's Disease, and involves a much more extensive area. In addition to this there is a punctiform rash on the soft palate and the throat is a bright red color.

2. A mild degree of inflammation of the tonsils is very common; but follicular exudation is very rare, and true membrane formation was never encountered.

3. The uvula has often appeared unusually small for the ages of the patients.

4. The buccal mucosa varies only slightly in color during the acute stage, and the blood vessels are only occasionally so markedly congested as in measles and scarlet fever. Rarely a macular rash is seen on its surface and in such cases Koplik's spots may be closely simulated.

5. The tongue is usually heavily covered with a grayish or yellowish white coating, the edges and the tip being devoid of covering. Frequently the coating is geographical in its outline. The papillae are not found to be especially prominent or enlarged. The tongue of poliomyelitis differs definitely in its characteristics from that of scarlet fever.

6. Gingivitis occurred in a small proportion of the patients. The epithelial debris covering the gums was only rarely as marked as that often seen in measles.

7. Rashes occurred so frequently, (in approximately 10 per cent. of the cases), that it would appear they must not be regarded merely as coincidental, but rather should be classed under the symptomatology of the disease. Eruptions were most frequent in the younger children. They may appear as early as the second day or as late as the 5th or 6th week. Their average duration is about 4 days. In distribution, the rashes showed a decided tendency to localize to the trunk, being more prominent on the neck and chest, and to a lesser extent on the back, abdomen, and face. Bulbar cases rarely showed an eruption while meningitic cases were frequently so accompanied. The type most commonly encountered was the pin-point to pin-head papular variety. It was rather frequently preceded by a scarlatiniform eruption. When purely scarlatiniform it may closely resemble that of scarlet fever, but not to such an extent that a differentiation cannot be drawn between the two. We rarely encountered

# A CLASSIFIED STUDY OF 30 UNSELECTED CASES OF POLIOMYELITIS WITH REGARD TO RASHES \*

CASE	AGE	ERUPTION		TYPE OF RASH	DISTRIBUTION OF RASH	TYPE OF THE DISEASE	REMARKS
		ALREADY PRESENT	APPEARED ON				
1 H. M.	2 years	5th day	.....	Scarlatiniform and pin-point papular.	Face, neck, upper chest and back.	Myelitic.	Recovered
2 M. L.	9 months	5th day	.....	Maculo-papular and pin-point papular.	Face, neck, chest and back.	Myelitic, hydrocephalic, meningitic.	Recovered
3 M. M.	21 months	.....	17th day	Pin-head papular and macular.	Face, chest, back, abdomen and extremities.	Admitted with myelitic plus, intercostal paralysis, developed bulbar type, 15 days after admission.	Died
4 M. C.	3 years	4th day	.....	Pin-head papular.	Neck and upper back.	Bulbar.	Died
5 H. P.	9 years	5th day	.....	Scarlatiniform and pin-head papular.	Neck and upper chest, abdomen.	Meningitic, hydrocephalic, cranial nerve involvement.	Recovered
6 T. K.	2 years	7th day	.....	Pin-head papular and macular.	Neck, chest and back.	Meningitic and hydrocephalic.	Recovered
7 M. M.	2 years	5th day	.....	Pin-head papular fading.	Neck, chest and back.	Myelitic, hydrocephalic, meningitic, cranial nerve involvement.	Recovered
8 M. O.	16 months	4th day	.....	Pin-head papular.	Generalized except for extremities.	Myelitic (intercostal paralysis), marasmic symptoms.	Died
9 Y. L.	2 years	7th day	.....	Pin-head papular and macular, fading.	Face, neck and upper chest.	Myelitic, hydrocephalic, meningitic.	Recovered
10 E. H. Same patient	2 years	7th day	.....	Scarlatiniform and pin-head papular.	Chest and neck.	Meningitic.	Recovered
11 P. H.	2 years	.....	32 days	Pin-head papular.	Generalized except for extremities.	Meningitic.	Recovered
12 E. J.	3 years	.....	5th week	Scarlatiniform.	Neck, arms, chest, back, abdomen.	Myelitic, hydrocephalic.	Recovered
13 B. Z.	22 months	5th day	.....	Pin-head papular, scarlatinal form.	Neck, arms, legs, chest, back, abdomen.	Myelitic.	Recovered
14 J. C.	12 months	8th day	.....	Pin-head papular fading.	Face, neck and upper chest.	Myelitic, hydrocephalic.	Recovered
15 C. C.	15 months	.....	14th day	Pin-head papular.	Chest, arm and face.	Myelitic.	Recovered
				Pin-head papular fading.	Generalized except for extremities.	Myelitic.	Recovered



16 G. F.	2 years	8th day	Pin-head papular.	Neck, chest, back, abdomen.	Meningitic.	Recovered
17 M. M.	4 years	10th day	Pin-head papular.	Neck, chest, abdomen, back.	Myelitic, hydrocephalic, intercostal.	Recovered
18 E. J.	2½ years	14th day	Fading, pin-head papular.	Body and arms.	Myelitic, (intercostal paralysis), developed broncho-pneumonia.	Died
19 V. H.	7 years	4th day	Scarlatiniform, pin-head papular.	Neck and chest.	Myelitic.	Recovered
20 G. B.	18 months	5th day	Pin-head papular.	Neck, chest and face.	Myelitic.	Recovered
21 A. C.	3 years	7th day	Pin-head papular.	Face and chest.	Myelitic hydrocephalic, cranial nerve involvement.	Recovered
22 M. H.	5 years	6th day	Scarlatiniform, hemorrhagic in places.	Chest, upper abdomen and shoulders.	Meningitic.	Recovered
23 F. H.	4 years	5th week	Scarlatiniform.	Arms, neck, abdomen and back.	Myelitic and meningitic, cranial nerve symptoms.	Recovered
24 H. H.	3 years	14th day	Pin-head papular.	Chest and upper extremities.	Hydrocephalic, myelitic, intercostal.	Recovered
25 T. C.	2 years	7th day	Pin-head papular.	Neck, upper chest and back.	Myelitic, hydrocephalic, intercostal, later bulbar.	Died
26 L. N.	7 months	8th day	Pin-head papular fading.	Face and chest.	Myelitic, cranial nerve involvement.	Recovered
27 R. R.	18 years	9th day	Pin-head papular fading.	Neck and chest.	Myelitic.	Recovered
28 S. C.	1 year	5th day	Pin-head papular.	Neck, upper arm, chest, upper abdomen.	Myelitic.	Recovered
29 T. S.	2 years	7th day	Pin-head papular fading.	Chest, abdomen, back, neck.	Myelitic, intercostal.	Recovered
Same patient		24th day	Pin-head papular.	Rash reappeared on chest and neck.	Myelitic, intercostal.	Recovered
30 T. W.	2 years	6th day	Macular and pin-head papular.	Face, neck, chest and back.	Myelitic.	Recovered

#### EXPLANATION OF CHART

\* Under the column marked "eruption already present" are placed all cases admitted to the hospital with an eruption, and the day mentioned beneath is taken from the history as to the number of days **III** before admission. So indefinite were parents' histories as to date of appearance of the rash before the child came to the hospital, that it was not considered **safe** to attempt to estimate the number of days the rash had **already** been

present when the child appeared for treatment. Under the heading "eruption appeared on," are cases in which the eruption appeared at varying intervals after the patient entered the hospital; these cases provide more accurate data as to the time the eruption lasts than the previous group, but are numerically greatly inferior.

a true maculo-papular type of eruption, and in the few instances in which this occurred, there was no difficulty in making a differential diagnosis from measles. The pin-head papular rash would seem to resemble most closely, if it is not identical with, that variety of miliaria called miliaria papulosa. It seems probably that the rashes are due either to the sweating, which is so prominent in the disease, or else to the toxemia arising from the infection of the intestinal tract.

8. Herpes labialis are very rare in poliomyelitis,—an important point in differential diagnosis from cerebrospinal meningitis, in which they are common. True herpes zoster was not seen in our cases, but herpetic-like lesions were not uncommonly encountered but they were distinct in their characteristics from the true variety.

9. Desquamation is rather frequent in poliomyelitis. It is usually furfuraceous, but not infrequently starts as minute pin-point papules which rupture at their summit, and thence involve the neighboring cutaneous surface, and in such cases resembles closely scarlatinal peeling. It is noted earliest and is more pronounced on the neck and chest. Besides true desquamation, there is "cutaneous exfoliation" which is much more common, more persistent and often exceedingly pronounced. It is probably due to a trophic change.

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## A CASE OF PLURIGLANDULAR DISTURBANCE; ORGANOTHERAPY; CURE

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The patient, E. E. K., a boy  $7\frac{1}{2}$  years of age was referred to the writer by Dr. A. A. Brill, in December, 1915. The complaint at that time was an erythematous and pustular condition of the digits of both hands and feet, especially the latter; great fatigability; slowness in physical growth with sluggish mentality and uneven temperament. This condition had gone on for almost a year and was steadily growing worse.

*Past History.* Weight at birth  $5\frac{1}{8}$  pounds; at end of first year 23 pounds. Dentition normal. Walked at fourteenth month. Measles and pertussis at 3 and  $6\frac{1}{2}$  years. Of importance is the fact that tonsillectomy was done in October, 1913. Both testicles were undescended until  $1\frac{1}{2}$  years ago, and at present examination are in the inguinal canal.

*Heredity.* Father had psychosis of probably dementia praecox character, but also has tendency to acromegaly. Grandmother has hypothyroidism (mild), as has one maternal uncle also.

*Present History.* The boy had always been bright and cheerful until January, 1915. He then developed pertussis for which "antitussin" was injected 5 times. The whooping cough lasted for 8 weeks, nevertheless, and was succeeded by a marked sensitiveness at the nails of the fingers and toes and beginning pus formation in these regions. The lobes of the ears became likewise affected. At the same time the skin began to be very dry. He complained of great lassitude, loss of appetite, and his sleep was restless. Mental fatigue was apparent. A physician then proposed a more nourishing diet with much malt, and treated the skin with cocoa butter and oils. He evidently recognized in part the true condition, for he administered—after the former remedies proved ineffective—thyroid gland, but after a short trial discontinued it. Iron and arsenic were substituted. A tuberculin test proved negative. The blood picture was on May 15th, 1915 (Dr. Stafford McLean): Red cells, 5,400,000, white cells 6,200,

hemoglobin 88 per cent. Differential count: Polymorphonuclears 52 per cent., transitionals 4 per cent., lymphocytes 44 per cent., no eosinophiles.

Wassermann (two separate reports) proved negative. The boy's condition gradually became worse, he lost weight, his fatigue became extreme, the fingers became purplish at times and swollen and the pus increased. The patient was kept in bed. Another physician, who was now called in, made a diagnosis of endarteritis and prescribed potassium iodide and saline enemata. The feet were very painful and even occasional attempts at walking were carried out with difficulty. This was in June, 1915.

In July, 1915, numbness in the extremities developed with increasingly painful paroxysms, especially at night. At these times paresthesia also supervened, and sleep was almost impossible. On hot days, the extremities were better. As the boy's condition was becoming wretched, with increasing pain, intense fatigue, great mental dullness and a constantly decreasing weight, the treatment with iodides and enemata was discontinued and he entered one of the New York hospitals in August, 1915. The hospital examination gave a negative result as to abdominal disturbances—spleen and liver were not palpable and no masses were felt; his temperature varied between 99° and 100° (rectal), pulse rate 90-120, blood pressure 95 m.m. systolic, eye grounds negative, Wassermann negative, Schick negative; while an x-ray by Dr. Stewart showed delay in bony development. His blood on August 19th, 1915, showed the following: Red cells: 3,880,000, hemoglobin 60 per cent. White cells 7,600: Polymorphonuclears 55 per cent., small lymphocytes 41 per cent., large lymphocytes 3 per cent., eosinophiles 1 per cent.

At the hospital, on general tonic treatment, he improved much in certain respects; he gained 5 pounds in 2½ months, his blood count became more normal, the red cells increasing to 4,860,000 and hemoglobin to 85 per cent. But the peculiar affection of his extremities, his sluggishness, his moody temperament remained as before. In October the diagnosis at the hospital on discharge was pemphigus. As the condition did not improve a well-known dermatologist was consulted, who after thorough laboratory and physical examinations, pronounced the condition "an atypical Raynaud's Disease" ruling out syphilis and pemphigus. He recommended potassium iodide, but with no result. The case then was



referred to Dr. A. A. Brill, chiefly on account of the mental condition of the boy; his sluggishness, chafing under restraint and discipline, and lack of adaptability making him an ever-growing disturbing factor at home. Dr. Brill at once recognized the probability of the endocrinopathic basis of the disturbance and referred the case to the writer in December, 1915.

*Examination in December, 1915.* The patient, a boy,  $7\frac{1}{2}$  years of age, appeared poorly nourished, pale and anemic. Station and gait were normal. Height  $46\frac{3}{4}$  inches, weight  $42\frac{1}{8}$  pounds.

*Muscular System*—Generalized weakness of the entire musculature, but no atrophy, no tremor, no incoordination, no mykymia.

*Sensory System*—Objectively, normal sensation; subjectively, some pain over the left shin bone at the middle.

*Cranial Nerves*—No abnormality; the fundi of both eyes seemed normal though the left one showed rather full veins.

*Reflexes*—All normal and bilaterally equal; no Babinski; pupils react to light and accommodation.

*Corticopsychic*—No astereognosis, no aphasia, no apraxia, no asymbolia.

*Genitourinary System*—Testes only partially descended, one being felt in the inguinal canal and the other at its exit.

*Cardiovascular*—Blood pressure 80 systolic, 45 diastolic. Pulse 85 while at rest sitting. Heart seems normal though its musculature seems weak. There is a vasomotor paresis, evidenced in all four extremities, whose characteristics are a fullness of the digits, redness approaching a purplish tinge, with pustular and furuncular incrustations at the borders of the nails. The nails seem fairly normal but brittle. The extremities are extremely cold to the touch and are subjectively so to the patient also. The duskiess of the digits of the feet extends back, encroaching on about one-half of the foot and gradually fading into the ordinary skin color. Both dorsalis pedis arteries can be felt. The condition resembles erythromelalgia.

*Viscera*—No abnormality can be determined. The spleen is not palpable.

*Mental Status*—The boy lacks self-control; he is pugnacious and resentful; is impatient of his mother's criticisms and answers back with lowering brow and patent enmity. He takes an interminable time to dress and undress for the examination and no

amount of persuasion can change this. He lacks initiative and is getting dull and more sluggish than ever. He is not amenable to discipline, and is so refractory at home that his mother is deeply concerned. When questions do not please him his reply, if any, is accompanied with a snarl. He is careless in his dress. He does not play with other children and he has a hard time of it in a private school in which he is placed with children younger by a year or more than himself.

*Glandular System. Pituitary*—Incisors are large, widely-spaced, while his lateral incisors are almost rudimentary. The radiograph shows lack of development of the bony structures, and an x-ray of the skull by Dr. Evans shows a much contracted sella turcica, but with clear sinuses. The testicles are undescended. The mental condition also is one seen occasionally in hypopituitary cases.

*Thyroid*—The hair is dull looking and brittle; the vasomotor red line as a reaction to skin stroking seen in normal subjects is practically absent; the lack of initiative and sluggishness may also partly be due to deficient thyroid activity. Lack of leucocytes also point to a thyroid deficiency.

*Adrenals*—The vasomotor paresis of the extremities, low blood pressure and general muscular fatigability point to a deficiency in the adrenal medulla.

*Thymus*—A general adenopathy in the neck and in the groin, in both of which regions discrete and fairly small glandular masses are apparent.

*Gonads*—Testicles are undescended; the conformation of the penis between two almost divided scrotal pouches approached the female type—possibly reciprocal to the lack of pituitary development.

We have therefore a boy in whom practically every abnormality points to a glandular disturbance. Not alone this, but his hereditary factors point in the same direction. If we subtract from his picture the vasomotor disturbances in the extremities, we get a dominant picture of a mental disturbance which might easily be interpreted as a beginning dementia praecox. And yet many endocrinopathies presumably may be traced back to just such beginnings. In this particular case, the vasomotor disturbances gave the key to the solution.

*Theory of Treatment*—In all internal glandular disturbances, it is of paramount importance to determine, if possible, the original gland at fault. If one merely takes the view that because certain symptoms are referable to a single gland, the administration of that gland will prove effective therapeutically, he falls into error. For the symptoms evidenced as due to a particular gland, may have been produced by a disturbance compensatory to the original imbalance, and treatment directed to that gland will overcome, by interfering with its activity, any compensation that might have been established. In this particular instance, we can trace back to the father symptoms of pituitary disturbance (acromegaly). Pituitary disturbances are evidenced in this boy by his deficient bony development, including his small sella turcica. As secondary accompaniment, compensating for the pituitary deficiency, we usually find both adrenal and thyroid overactivity. But the thyroid capacity of the boy was limited by the hereditary deficiency of thyroid on the mother's side, and any call upon it remained only partially answered. It therefore devolved upon the adrenals to furnish the necessary controlling element in metabolism as best they could. Their output presumably was used to best advantage in the metabolism of the organism by maintaining the blood pressure at a fair level, and in controlling to a slight extent the sugar mobilization necessary in the muscular activity of a growing boy. When this muscular activity was checked by rest in bed for a period of 8 weeks in the hospital, the adrenals could be used for the other purposes of the body—namely, improvement in the blood picture (from 3,600,000 to 4,800,000 cells and 60 per cent. to 85 per cent. hemoglobin) and some return of bodily vigor. The symptoms referable to the thymus gland—general mild adenitis—were possibly due to interference with this unit of the internal glandular system by the enucleation of the tonsils some years earlier. It has frequently come to my notice that tonsils were removed merely because they were large and because they could so easily be removed in one operation together with the adenoid vegetations. I strongly object to such a procedure. Many times in my own experience—while tonsillitis attacks never thereafter occurred,—yet a general systemic affection with adenitis would develop after some mild throat and pharyngeal infection. The gonadal system in this boy was probably checked in its development by the combined lack of pituitary, thyroid and suprarenal



cortex secretions, the small amount available of these being used up for more important immediate use in the organism's metabolic processes underlying vital continuity. The internal glands had been fairly compensating in earlier life, but the evidently severe attack of pertussis in March, 1915, probably drew so much of the suprarenal secretion to combat the infection, that the entire line gave way and the symptom complex resulted.

*Treatment*—It would therefore seem as though the key to the situation was the pituitary condition, which if corrected, would release enough of the suprarenal supply to perform the necessary work on the sympathetic nervous system, especially in the control of the smooth muscle fibre of the arterioles. If enough adrenalin were administered at the same time it might materially assist in releasing an amount of the suprarenal secretion for duty elsewhere. The pituitary medication was therefore begun at once, December 14, 1915, in the form of whole gland capsules (made by H. T. Perry) administered twice a day, one hour after meals. Together with these, 3 drops of adrenalin in salt solution were given by mouth three times daily, after meals. For two weeks succeeding this medication, the patient slowly improved. His blood pressure rose to 92 m.m., he seemed to have more initiative, and he was less cross and more amenable to direction. His weight remained about 42½ pounds. The extremities were about the same, but less painful.

By January 18, 1916, (5 weeks after beginning the treatment) he was still improving mentally. His stature had increased ¼ inch; his weight was 43 pounds. As his weight gradually improved, it was thought wise to begin with small doses of thyroid, as this gland was second only to the pituitary in its deficiency. The adrenalin was stopped—it was only given originally to tide over the first few weeks—and thyroid gr. 1/10 (B. W. & Co.) twice a day was ordered.

By February 8, 1916, he had markedly improved in all particulars. He was less aggressive, less sluggish, less pugnacious. Fingers and toes had a better color, and the pustules were disappearing. He dressed himself in 5½ minutes—something unheard of before. Weight 43¾ pounds. Thyroid was increased to gr. ¼ twice a day. Pituitary as before.

March 9, 1916. Increase in height since December, 1 inch (47¾). Improvement continues in all directions; cyanosis of



toes and fingers absent. Blood pressure remains at 90 m.m. Weight  $42\frac{3}{4}$  pounds. On account of slight headaches, the pituitary was discontinued and thyroid increased to gr.  $\frac{1}{4}$  three times a day.

April 4, 1916. Condition generally not so good since stopping pituitary. Blood pressure 86 m.m., toes and fingers cyanotic again. Pituitary in the same form as before was given, 2 capsules a day, one hour after meals. Thyroid as before.

May 11, 1916. Weight  $44\frac{1}{8}$  pounds. General condition excellent. Cyanosis of extremities gone. Examination of the testicles shows both below external ring. Vasomotor skin line fairly pink. The boy is now quite well, obeys orders, has changed from his aggressive, abusive attitude towards his mother, to one of affection and respect. Height 48 inches.

June 17, 1916. Improvement continues. Extremities remain normal. It was thought well to discontinue partially both pituitary gland and thyroid for the summer. New dosage of pituitary, one capsule a day; thyroid gr.  $\frac{1}{4}$  twice a day.

October 21, 1916. Weight 47 pounds; height  $48\frac{7}{8}$  inches. That is a gain of  $2\frac{1}{8}$  inches in height in 9 months. Both testicles are well descended into the scrotal sac. The hair is now glossy and smooth, the extremities are in perfectly normal condition. His mental condition is excellent and is undergoing the usual transitional period—childish antics and silly behavior, with a sunny disposition. Gets along well with other boys, now in the public schools and has the usual quarrels attendant upon their games. Is therefore practically well. As the vasomotor skin reaction showed rather a white line, it was thought wise to give suprarenal gland (B. W. & Co.) gr. 5, per day, in divided doses, but as after a week of the treatment he became hyperactive and excitable, it was discontinued. Pituitary gland was reduced to 1 capsule a day during alternate weeks, but thyroid remained at gr.  $\frac{1}{4}$  twice daily.

December, 1916. All medicine now discontinued for the patient is in all respects a normal child, physically and mentally. His height is  $49\frac{3}{8}$  inches, and his weight  $47\frac{1}{2}$  pounds; representing in just one year's treatment a growth of stature of over  $2\frac{1}{2}$  inches, and a gain in weight of about 5 pounds. This gain in weight, although slight, still was put on in the face of continuous thyroid administration. An x-ray of the skull, taken by Dr. Le

Wald, of St. Luke's Hospital, some months ago, showed a sella turcica much deeper than before and a bony development which was within normal variation. No symptoms whatever referable to the extremities.

January 23, 1917. The boy has had no treatment for 4 weeks. His temperament shows some slight return to its former condition of aggressiveness and opposition. His extremities are slightly bluish at times only. The blood pressure is only 80 m.m. systolic. The pituitary treatment was begun again—one capsule a day only during alternate weeks. In a few weeks these symptoms had again disappeared, but it was thought well to diminish the pituitary medication only gradually and to that end one capsule was ordered on alternate days, for 2 weeks only.

March 10, 1917. No medicine at all for a month. Blood pressure 95 m.m. systolic; weight 49 pounds; height  $49\frac{5}{8}$  inches. Had been vaccinated in the interim with no bad sequelae except that the glands in both axillae were slightly swollen. Boy well.

May 12, 1917. Mother reports boy well continuously. Occasionally after pituitary is discontinued for a long period, she notices his moods return, but after a few days administration of the pituitary it immediately clears up the condition.

June 23, 1917. Examination preparatory to going to a boy's camp for the summer. Weight  $51\frac{1}{4}$  pounds. Height over 50 inches. General condition of body and organs excellent. Mentality excellent. Discharged, cured.

SUMMARY: This case seems highly instructive, not only from the viewpoint of clinical diagnosis, but also from the analysis possible of the internal glandular disturbance. It shows the necessity of properly integrating the clinical data and not superficially treating the symptoms as they appear visually to us. A very small deviation from the normal of internal glandular activity, if under or overcompensated, may give rise to the most diverse pictures clinically—from structural anomalies, to mental difficulties — from vasomotor abnormalities to gastrointestinal disturbances. And the difficulty is, that the same original glandular disturbance in each of two patients will give a clinical syndrome in one of acromegaly and in the other of Raynaud's Disease. The reason for this deviation is to be seen in the number of variables between the first cause and the final effect, namely, the other compensating glandular elements.

The necessity of administering pituitary gland as the basis of treatment is seen throughout the course of the disease. It was finally so nicely measured by the mother, that she knew when to stop and when to recommence its administration, so certain and immediate was its effect. And the criterion which to her was the most delicate to gauge, was the boy's mental state. She knew almost to a day when the pituitary ought to be begun after a lapse of weeks. The other symptoms were incidental to her—even though they attracted the eye more—such as blueness of the extremities. And if the treatment is correctly judged, one sole symptom as criterion is all that is necessary, for the other symptoms, no matter how they may dominate the picture, fall readily into the line of normality, if the treatment is the correct one. It is interesting to note how the cessation of pituitary administration led to a recurrence, even if mild, of some of the symptoms; and conversely how the readjustment took place upon the exhibition of pituitary gland. The thyroid therapy as secondary in importance to the pituitary, need not engage us long. It simply hastened the general metabolic processes besides making up for the slight primary deficiency. In all probability, pituitary gland alone would have sufficed to cure the patient albeit a longer time would have been necessary.

At one time during the pituitary treatment, the patient complained severely of frontal headaches. As this symptom frequently attends pituitary treatment, and not infrequently also is due to refractive ocular errors, the late Dr. Otto Shirmer was consulted as to the eye conditions. These he pronounced normal and hence the probability of pituitary headache became greater. Accordingly, the administration of the gland was stopped and the headaches promptly ceased. They did not return, even after beginning again with the gland. However, thereafter, the quantity was diminished, the intervals between doses being increased to whole days and even to two days. An analytical study of one such case as this, will give a greater insight into internal glandular therapy than the perusal of many pages of theoretical directions.

## STROPHULUS \*

By DOUGLASS W. MONTGOMERY, M.D.

San Francisco.

Among the papular itchy affections of infancy there is one called strophulus, that, taking the symptom-complex in its entirety, is well individualized.

The eruption consists of small, firm papules and minute vesicles, that arise suddenly on reddened spots scattered principally over the trunk, and to a less extent on the face and limbs. The course of events in the individual lesion is the appearance of a small spot of light red nettle rash, in the center of which there develops a pale or pale red, firm papule, with a minute yellowish crust on its top. Occasionally serum accumulates under the horny layer at the top of the papule, forming a vesicle. In some cases these vesicles may be very numerous and quite large, simulating the eruption of chicken-pox. The itching is so severe that the tops of the papules or vesicles are torn off, leaving excoriated, slightly bleeding points, or blood crusts. The eruption comes out in attacks, which are sometimes spaced from one another, and sometimes overlap, so that lesions in all stages of evolution may be present synchronously; there may be little nettle-rash wheals, papules, papulo-vesicles, excoriated papules, and faint stains where active lesions once were, all visible at the same time.

The red splotches and wheals tend to appear in the night, so that during the day the excoriations usually constitute the most prominent feature.

From my experience the disease is not at all frequent in San Francisco. The cool, even climate is not favorable for its development.

A most important part of the disease picture is the scratching; the little one is busy scratching its body and twisting in all sorts of ways till it looks like a martyrdom. The mother also enters into the picture with that anxious air of reproach that insists, in its imperative maternal way that something must be done and done quickly. The other members of the family stand around in the background, at times, however, contributing substantially to the confusion. In this tumult the physician has to make his diagnosis, especially from flea bites and from chicken-pox, which

\* Read before the California Pediatric Society (Northern Branch), Feb. 8, 1917.



the affection, as before mentioned, may very much resemble. It has also been confused with miliaria. Besides making his diagnosis, the physician must also council patience in an eminently impatient situation, and then settle down to that long investigation of the minutiae of infant feeding, and the condition of the alimentary canal, the tediousness and the inevitability of which is the medical man's daily experience. Usually, as the name *strophulus* would seem to indicate, this line of investigation will not be found fruitless. Even, however, if nothing is found in the digestive tract to account for the disturbance on the skin, and it must be said this sometimes happens, the character of the malady is such that a Scotch verdict of not proven must be given, and the diet and life of the child must, nevertheless, be regulated.

Topical remedies must also be thought of, and would have to be prescribed even though they were entirely valueless. As it so happens, however, they are far from being useless. Fortunately the antipruritics are at the same time antiseptics, and shield the infant from pyogenic infections, consequent on the scratching and excoriation.

For years I have made it a rule never to tell an adult not to scratch. What is the use? It merely vexes the patient. I just as rigidly hold to the rule not to tie an infant's hands, nor to put it in splints or a strait jacket, even though the nails become worn down and glitter like highly polished metal. Under such circumstances it is a more exquisite torture not to be able to scratch than to do so, even to the extent of causing copious bleeding. It was a fine human touch of Dante, that, on seeing the damned ones scratching vigorously, instead of telling them to desist, he more charitably wished that their nails might eternally suffice for the work. Indeed, instead of being a detriment, scratching may be turned into a benefit, if, at each pruritic storm, the patient is supplied with an antipruritic application that is at the same time mildly antiseptic. Through the vigorous rubbing and tearing the application is most thoroughly introduced.

*Strophulus* is not strictly confined to infants. I have now under my care a man who has crops of itchy lesions looking like little red wheals, and which were at first mistaken for flea bites, from which they differ in not showing the central-hemorrhagic puncture. These lesions are light red, prominent, edematous, about one-half a centimeter in diameter, and irregular in con-

tour. Many of them have a most minute vesicle on their center. The lesions are not excoriated, because the application, a zinc oxide, starch, salicylic acid paste made with glycerine, immediately stops any itchiness. The man has intestinal indigestion, with the production of much flatus of an evil odor.

One of the best topical applications is one called on the Continent, Boeck's Paste, where it is much employed in various skin affections. In one sense of the term it is not a paste, but a lotion. Its efficiency in strophulus is much increased by adding to it ten per cent. of a coal tar emulsion, the best form of which is the liquor carbonis detergens:

R

Liq. carbonis detergent. ....	30.00
Amyli	
Talc āā .....	40.00
Glycerine .....	20.00
Gummi arab. ....	1.00
Liq. plumbi subacetat. ....	4.00
Aq. ....	200.00

M.

Sig. Use several times a day as a lotion.

Another excellent topical application is phenol in aromatic vinegar:

R

Phenol .....	10.00 or 15.00
Acetic. aromatici. ....	300.00

M.

Sig. Apply as required to allay itching.

Powders from their simple effect as powders, as being cooling, antipruritic, and as soaking up exudates and thereby preventing infection, are always to be employed. The ordinary borated talc is adequate, or one made of:

R

Acid salicylici .....	6.00
Amyli	
Acid boracic āā .....	150.00

M.

Sig. Use as a powder.

The following tar zinc paste is also excellent:

R

Zinci oxid.

Talc āā ..... 20.00

Vaselini ..... 40.00

Ol. rusci ..... 2.00 to 4.00

M.

Sig. Spread in a thin layer over the skin and then powder the surface.

The tar acts as an antipruritic and as a disinfectant, and the pasty consistency of the application favors the absorption of exudations, covers and protects wounded surfaces, and shields the skin from irritation, as of the clothing, and from changes of temperature.

The name strophulus is a resuscitation. It was first given to this disease by Bateman, who also seems to have called it lichen urticatus. The term strophulus afterwards fell into desuetude, and was revived by some of the great continental dermatologists. The reasons for this revival are interesting. The itchy papular diseases of the skin constitute one of the most confused groups in dermatology, and under such circumstances it is wise to choose some striking name for any particular symptom-complex, such as strophulus, that it is desired to segregate into prominence.

What literal meaning Bateman meant to attach to the word is not quite clear. The word strophulus is the diminutive of strophus, a binder, and may have served to indicate that the eruption is apt to occur under that article of a baby's clothing. Strophus also means colic from its original meaning, to turn or twist, and may, therefore, be assumed to indicate a connection between the eruption and the colicky pains so frequent in infancy, or finally, it may refer to the contortions of the little sufferer. Brocq has proposed the name acute prurigo simplex. Long ago Hebra remonstrated against the loose use of the term prurigo as prevalent in his day, and restricted it to a definite disease, that is not infrequent in Vienna, but is rare elsewhere. I do not mean to imply that Brocq is loose in his use of terms, because he is not, but if one group of the papular itchy diseases is segregated out as strophulus, another as lichen, and another as prurigo, a distinct advance in clearing up a confused situation will be attained.

At one time all papular itchy diseases were called lichen, and strophulus as being among them, received the name lichen urticatus, as indicating both its papular and its urticarial character. This name, however, is also given to a particularly irritable form of erythema multiforme that occurs on the external surface of the extremities, especially of the arms, in young girls\*. Furthermore Vidal called the disease lichen simplex acutus. As before mentioned it is undoubtably better to restrict the term lichen to the great disease lichen, so as to avoid, as far as possible, any confusion between it and the other itchy papular diseases.

Strophulus has also been called urticaria papulosa, or papular urticaria, which indicates both its urticarial and its papular character.

As regards the nature of the eruption of strophulus it should never be lost sight of that it is both urticarial and papular, and that the papule is as essential as the urticaria. Even in the very early stages of a lesion before the papule is visible on ordinary inspection, if the skin is put on the stretch the papule becomes visible as a central spot looking like a drop of wax.

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CEREBROSPINAL MENINGITIS FROM STREPTOTHRIX (La *Pediatrics*, 1915, xxiii, p. 711). G. Rutelli describes the case of a girl, aged 6 months, admitted with symptoms of cerebrospinal meningitis. Ten c.c. of fluid obtained by lumbar puncture was turbid and formed dense white clots after a few minutes. The microscope showed numerous white cells, the neutrophile polynuclear leucocytes being prevalent, several erythroblasts and abundant filamentous organisms resembling streptothrix. An emulsion of this organism injected into the peritoneum of some white mice caused death in three days. The patient's blood did not agglutinate them. A second lumbar puncture gave identical results. Urotopine was given in doses of 1 grm. daily. The temperature continued irregular and intermittent but never rose above 38.5° C. The sequel of the case is unknown as the parents removed the child from the hospital.—*The British Journal of Diseases of Children*.

\* Zirkulationsanomalien de Haut von Prof. Dr. Leo V. Zumbusch. *Hautkrankheiten* von E. Riecke, Jena, 1914



## THE CARE AND MANAGEMENT OF THE CARDIOPATHIC CHILD \*

By WILLIAM L. ROST, M.D.

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The object in presenting this paper is not to contribute anything new, but to review and emphasize the salient points in the care and management of children afflicted with cardiac disease.

Although much anxiety is often shown when a murmur, that is most commonly inorganic, is heard over the precordium, one cannot help but comment upon the mismanagement and oftentimes neglect of serious manifestations of heart disease. When we stop to consider the possible effects of a diseased heart upon other vital organs, we can readily appreciate the importance of competent and careful management during an acute carditis and the necessity of a well regulated convalescence of not too short a duration.

Our city hospitals do not have the proper facilities for the care of convalescing cardiac cases; only too frequently are patients sent home just as soon as the febrile stage is over or compensation partially established, and what is the result? A large number of these unfortunate children go about with imperfectly compensated hearts, are anemic, dyspneic, have poor digestion and are ill nourished; soon to be re-admitted to a hospital, with hearts in a worse condition than the primary attack. These unhappy little patients are handicapped for life and sooner or later become a burden to the community and to themselves. I do not hesitate to state that at least 50 per cent. of the unfortunates can be saved from an early grave and a good many permanently cured by caring for them in a convalescent home in the country under competent medical supervision.

In searching into the etiology of heart disease we find that rheumatic infection stands out most prominently although other infectious diseases such as scarlet, diphtheria and severe influenza are not to be lost sight of. The toxins elaborated by the various organisms causing these maladies have a very deleterious

\* Read before the Bronx County Medical Society, April 18, 1917.

effect on the myocardium, and when this is seriously damaged, the propulsive force of the circulation is hindered, a vicious circle established and sooner or later the patient must succumb; fortunately however, the myocardium of young children has great recuperative proclivities and if these little ones be given a fair chance and proper treatment instituted, recovery may follow in the majority of cases. The rheumatic infection may manifest itself in so light a form as to go unrecognized, or it may be so severe as to destroy life in a very short time.

We must not forget that growing pains, torticollis and tonsillitis are danger signals; chorea might be added, but here we most frequently find the heart already involved; a child that frequently complains of being tired should be repeatedly and carefully examined. Most commonly rheumatic infection reveals itself in the form of an acute tonsillitis, which strange as it may seem is considered a trifling condition by a great many and left to the parent or the druggist to treat with the "yellow throat mixture." It is not uncommon for us to hear a mother express herself, "oh, it is just a 'touch of tonsillitis'" and I have often wondered, with whom these so-called "touch diseases" have originated. I know they are an abomination and ought to be relegated to the realms of innocuous desuetude. To me it has appeared more rational to treat cases of tonsillitis with caution. We must not forget and ever be on the alert for the possible dangers that might arise from even a slight "touch of tonsillitis."

Let us now see what happens when a murmur is heard over the precordium during a routine examination for some other ailment; immediately the parents are alarmed, and informed that the child's heart has a leak, or that it is diseased, the little one's activities restricted and cardiac tonics prescribed; to me these statements seem at times inhuman; no other evidence of cardiac disease except a systolic murmur does not warrant the diagnosis of heart disease. It must not be forgotten that childhood has its own peculiarities and that many of the murmurs and irregularities heard over the precordium are of no serious import and disappear when the child's general condition improves, or spontaneously at puberty. It is not uncommon to observe an instability about the heart action of young children, just as we do about their nervous system; the cardiac action is much more disturbed, not only because of the nervous instability, but because of

the incomplete heart development as well; as a result a large number of developmental disorders appear; the child's heart is compelled to keep up the circulation already established besides adapting itself to the changing circulation brought about by the growth of the entire body. Remembering these facts we should allow for these physiological variations just as we allow for a child's cerebral activities without considering them pathological. Since we admit that a large number of murmurs heard over the precordium are functional, it may not be out of place to note some of the characteristics of organic murmurs.

Doctors James Mackenzie and G. A. Sutherland lay down the following rules:

1. Organic murmurs are usually persistant under varying positions of the patient, during rest and after exercise and from day to day.

2. They tend in well-marked cases to be louder and harsher and to have a wider range of conductivity. (In early valvulitis it is soft and blowing.)

3. Organic murmurs have often a musical element or other characteristic tone not heard in functional murmurs.

4. The first or the second sound of the heart is often obscure or faint or entirely replaced by the murmur.

5. A definite point of maximum intensity about the apex or aortic area is observed.

The murmur most commonly heard in children is a mitral regurgitation.

L. E. Holt, in his new book, cites Boynton, who having autopsied 150 cases of cardiac disease found that 149 had mitral disease; in 9 there was marked mitral stenosis; in 51 cases the aortic valves were effected, 9 of which were seriously involved.

John Priestly, in his examination of over seventy thousand school children, found 626 cases of acquired heart disease, and gives the following analysis.

Mit. Reg.	Mit. Sten.	Mit. Doub.	Aortic.	Tricuspid.	Pulmonary.
562	27	49	7	5	26

Among 2,259 children coming under our observation we found 219 cases of acquired cardiac disease, with the following lesions:

Mit. Reg.	Mit. Sten.	Mit. Double.	Aortic Dyast. and Mit. Sys.
208	1	9	1

Dr. A. L. Goodman states that 24 per cent. of the admissions to the A. Jacobi division of the German hospital have acquired cardiac disease; the most common form being mitral.

The question presenting itself, is, what is the significance of organic valvular murmurs? Taken by themselves they are of no aid in the prognosis or the treatment of the case; we may assume, however, that a murmur is indicative of a valvular lesion and it is the valvular lesion and its significance on the circulation which should concern us. The most vital part of the heart is the left ventricle; no matter what the lesion may be; endocardial, myocardial, or pericardial, so long as the left ventricle responds to its burden no symptoms of disturbed cardiac activity will result; but when as a result of repeated attacks of rheumatic infection a progressive carditis develops and signs of decompensation are evidenced, the end is not far off; if, however, the circulatory disturbance be due to a disordered rhythm, or develops as a result of an acute illness and the musculature of the heart is not diseased, the embarrassment to the left ventricle may be only temporary.

The diagnostic signs of acute cardiac decompensation in childhood are enlargement of the liver, cyanosis, dyspnea, cough, pulmonary congestion, diminution in the urinary output, hemoptysis, edema and anasarca. Subjectively, they complain of shortness of breath, palpitation, precordial pain, faintness and tiredness. Too much stress should not be laid on these symptoms without being able to account for them by physical examination of the heart. If these symptoms precede the physical signs of cardiac decompensation, one might look to other portions of the anatomy to account for them.

*Management:* Since cardiac disease is usually secondary to rheumatic infection, we must look to the latter. The earlier and more often we detect this infection in childhood and the more thorough our treatment the less will be the incidence of organic heart affections. It is unfortunate, but true, that in the largest majority of instances the early or slight manifestations of this infection are little heeded and medical advice only seldom sought for; not until the ravages of this disease have the poor victims in their grasp do parents often seek aid. These little patients in particular are the ones requiring all our energies, skill and devotion, not only from a medical point of view, but from a hu-



manitarian point of view as well. Many a case is brought to our clinic for some trifling condition and a past history reveals either the "touch of tonsillitis" or the so-called growing pains or stiff joints and an examination discloses a miserable, anemic, undernourished child, with a crippled heart. If we would only remember that the tendency of the young is to regenerate and progress and not to degenerate and retrogress and do all in our power to care for and protect these children, a great deal of unhappiness and misery and money to the state could be saved.

We insist on the proper care of cases of incipient tuberculosis, we build sanitariums, preventoriums, and what not to enable these victims to recover, yet how little we do for the early or incipient cardiopathic child. In our clinic we have little or no difficulty in sending to the country an early case of tuberculosis for a stay of weeks or months; but when it comes to a child with heart disease, "the Lord help him." I have gone into this matter quite thoroughly, and must admit that our efficient and well-organized social service cannot help this state of affairs because there is no place to send these cardiac cases to. Why should not our large hospitals have a convalescent home where these unfortunates may be sent to for a stay until they are able to go about their daily pursuits? It would be a credit to any institution to have such a home and the results obtained would amply repay for the monetary outlay. I am almost certain that our kind-hearted and benevolent men and women who give so readily toward the maintenance of our hospitals, would be happy to add another mite toward the upkeep of a convalescent cardiac home, if this problem was properly presented to them by our hospital heads.

Although we possess no specific remedy for rheumatic infection we must not forget that the thorough and systematic treatment with salicylates is productive of some good results and in some instances, according to English observers, prevents the development of cardiac disease. Since tonsillar infection occurs in nearly 90 per cent. of all acquired heart affections, it seems advisable that acute attacks of tonsillitis should be treated in bed and not allowed out of bed until the temperature has reached normal, and stayed normal for three to four days; a week to ten days is not too long in the majority of cases.

*Acute Rheumatic Fever:* This infection carries with it a dread and a fear in the majority of the lay minds, and rightly so; care-

ful treatment as well as judgment should be exercised; salicylates in conjunction with sodium bicarbonate in large doses should be given, if this cannot be tolerated, aspirin, salicin, or salophen may be employed; locally the oil of wintergreen, plain or combined with equal parts of belladonna and chloroform liniment is of service; relief may at times be had by applying moist hot compresses; absolute rest in bed must be maintained even though no carditis develops; when this complication does occur the rest in bed should be prolonged, if necessary six months and the administration of salicylates pushed, not for its effect on the valvulitis or myocarditis, but for its salutary action on the rheumatic infection still harboring in the patient. It is not generally recognized that as far as any direct treatment of the heart is concerned it has no effect. One cannot see the advantage in stimulating the acutely inflamed organ, on the contrary, that organ requires rest and the best means at our command for that purpose are, opium, codein and bromides; these drugs allay pain and diminish excitability; for the pericardial pain or heart consciousness the ice-cap, if acceptable to the patient, or warm, moist compresses may be preferred; the gastrointestinal tract must be kept clean, and abdominal distention should be avoided by keeping the diet in not too fluid a state; the not infrequent administration of a purge or an enema will help keep the patient comfortable.

The question often arises, how long shall we keep our patient in bed? The rules laid down by Sutherland seem to me to be acceptable.

1. When the fever has subsided.
2. When the pulse rate has come down to within normal limits.
3. When the patient is not heart conscious.
4. When the dilatation of the left ventricle has become decidedly less or has entirely disappeared.
5. When the variation of the pulse rate from a lying to a sitting position is not great.

The mere presence of a systolic murmur with no other signs does not invalidate these rules and the prolonged rest cure should not be insisted on lest it prove detrimental to the patient.

*The Convalescent Stage:* This is a very important period of the patient's illness and any premature activity on the part of the

invalid is apt to set him back for weeks or even months; therefore the medical attendant must be cautious and exercise a great deal of tact. The home surroundings should be quiet, clean and cheerful; the patient should be encouraged; the diet should consist of fresh green vegetables, chicken, lamb and vegetable broths, lamb-chop, chicken, fish, eggs, milk, cereals and stewed fruits; a good table water, such as Poland or Apollinaris is useful and should be imbibed freely; these patients are left with a more or less severe anemia, and this must be combated; a good preparation of iron to which may be added a light wine, if there be no contra-indication, should be administered; occasionally dilute hydrochloric acid and pepsin may be taken to aid digestion. The patient is gradually permitted out of bed for short periods of time and kept in the sunlight; the length of time out of bed is gradually increased and a little walking allowed, careful watch kept on the pulse, fatigue and dyspnea must be avoided. Many patients feel more comfortable, and recuperate more rapidly, by a sojourn at the seashore, particularly to some of our southern watering places, and those who have the means should avail themselves of this change. The regular habits of the child are not to be pursued until the general condition as well as the cardiac musculature have returned to practically normal; finally the parents should be warned of the possibility of a repeated rheumatic invasion and the proper precautions taken. It is well to remember, as Dr. Henry Heiman, so aptly says, "that so-called rheumatism is a sensitizing and not an immunizing disease."

*Chronic Cardiac Disease:* In this class we find the little patients so frequently sent from school with a note to the parents that the child has a weak heart and must have a tonic. In our routine examination we find a considerable number who have murmurs, at the apex most frequently and at the base, but rarely with no other evidence of disturbed cardiac activity; these children require no treatment for their heart; we do, however, look after their defective teeth, infected tonsils, and general hygiene, and have their homes visited to note their home surroundings and instructions given as to the proper care of these cases. It is only when these children develop an acute infection, rheumatic or other, or when they present signs of decompensation, that treatment is instituted. A number of these chronic cardiacs suffer from reinfection with the rheumatic toxin, which has a pre-



dilection for the cardiac musculature, and as a result the left ventricle gradually gives way and the patients pass into the more serious class of cases, that in which signs and symptoms of cardiac failure appear. These symptoms vary greatly in different individuals and are practically the same as in adults; dyspnea, precordial pain, tiredness, insomnia, enlarged liver, edema, ascities, pallor, oliguria and cardiac dilatation; all are of grave import for the reason that the left ventricle is especially liable to give way under the burden owing to the progressive invasion of the disease, however, a good deal can be done at times to build up the heart functions and make the patient comfortable. In mild cases with slight symptoms a change in the habits or in the amount of exercise may bring about an improvement. In more severe cases absolute rest in bed for a long time may be imperative, careful regulation of the diet and the bowels and absolute quiet are all essential for the maintenance of comfort. When cyanosis is marked, venesection may be at times life-saving; oxygen, nitroglycerin and atropia are helpful in some cases. Cardiac stimulants are of little value when the cardiac failure has been a long time developing and where the muscular degeneration has been progressive; one is more apt to get response from cardiac stimulation where the weakness is only temporary; here whiskey, strychnia, caffeine, nitroglycerin, atropin, aromatic spirits of ammonia and camphor are useful; all of these remedies have only a temporary action and help tide the patient over a critical period. In certain cases where the renal function is also disturbed the administration of 40 to 50 grains of diuretin in combination with 2 to 3 grains of spartein sulphate daily in older children, seemed to me to be of service, theocin in 3 to 5 grain doses may also be tried.

We now come to the mainstay of cardiac therapeutics—digitalis. According to the observations of Dr. James Mackenzie this drug exerts its greatest influence in auricular fibrillation; this condition is rare in childhood, Dr. T. Lewis reports that in 116 cases collected by him only 4 were under twenty years of age.

Sutherland states, that the most striking results are obtained in cases of disordered rhythm in which a slower heart action is desirable, and owing to the fact that irregularities are much less common in association with organic heart disease in childhood,



one may readily understand why the range of digitalis therapeutics in early life is limited. Although this be true to a certain extent, yet I would feel that I had neglected my patient and disregarded the careful clinical observations of over fifty years' duration by one of our ablest clinicians if I did not administer digitalis in good size doses, particularly where the patient presents signs of edema, oliguria, and rapid pulse. In the few cases that we have observed, this drug in appropriate dose seemed to have been of service. In the administration of this drug we must be careful to obtain it in fresh solution and give it in sufficiently large enough dosage to produce results. If after seventy-two hours no appreciable improvement is noted, it is advisable to make a change. The earliest manifestations at times of the activity of digitalis is an increase in the urinary output. It should be remembered that children and young adults tolerate this drug well; occasionally, when indicated, the addition of *nux vomica* will lessen the tendency to stomach upset. A careful record should be kept and as soon as the urine is increased or the pulse rate diminished, the dose of digitalis should be reduced, it is by this means I believe that the so-called cumulative action of the drug will be prevented.

944 *Tiffany Street.*

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CAUSES OF CHOREA (Arch. de Méd. des Enf., 1915, xviii, p. 517). J. Comby insists that a slight acute encephalitis is the anatomical substratum of this disease. Out of 39 cases, in 6 evidences of hereditary syphilis were forthcoming, 7 of the 39 gave positive Wassermann reactions, 4 gave feeble or doubtful reactions, and 27 gave negative reactions. Clinical results do not give any satisfactory proof that the disease is syphilitic. Twenty-four of the 39 reacted positively to von Pirquet's test, but this was only a coincidence as tuberculosis is found in over two-thirds of hospital post-mortems. Evidence of articular rheumatism was only present in 6 cases and endocarditis in 8. In one case in every three evidences of rheumatism are forthcoming, an exactly similar result to that obtained for syphilis. Rest, milk diet, and arsenic in gradually increasing doses are strongly advocated.—*The British Journal of Diseases of Children.*

## CONGENITAL PARAMEDIAN SINUSES OF LOWER LIP \*

By NOXON TOOMEY, M.D.

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Before reporting a case of this abnormality I wish to summarize the literature of the subject because its complete bibliography has heretofore been lacking in English literature.

The anomaly was first reported by Demarquay<sup>1</sup> in 1845, who found ten cases in three families. Nine of the cases also had hare-lip. In 1858, Beraud<sup>2</sup> reported the abnormality in a case of hare-lip. Dépaul's<sup>3</sup> case had a small red granulation at the bottom of each cul-de-sac. The papular eminences were retracted. Murray<sup>4</sup> found four cases in a family that had many other congenital malformations. He attributed it to an intra-uterine disease of the mucous glands. Richet<sup>5</sup> found the abnormality in a child, its mother and grandfather, and in a family in which the sinuses alternated with hare-lip. Trélet<sup>6</sup> found it in a girl with equinovarus, double hare-lip and cleft palate. In 1869 Rose<sup>7</sup> reported a marked case in which the lower lip had a median cleft with a wide sinus about 2 cm. deep on either side. Rose is credited by Ahlfield with three other cases. A case was reported by Fritsche<sup>8</sup> in 1878. Hamilton's<sup>9</sup> case was from a hare-lip family and had a double hare-lip. The infant had a loose prominent lower lip with two small symmetrical papules on the lower lip that fitted into the clefts of the upper lip. In the papules were mucous secreting sinuses. Madelung<sup>10</sup> reported two cases and made a histological study of the lesion. He noticed that the flow of mucus may be free enough to be troublesome. He described a thin ring of skin and a semi-sphincter around the sinus mouths and noticed that the cul-de-sacs, usually convergent, were in one case divergent. Lane<sup>11</sup> in 1891, reported a case in a boy with double hare-lip whose father had a hare-lip. The lesion consisted of two slits leading into two small sacules on the inner aspect of the lip. The sinuses secreted mucus particularly at meal times. Zeller<sup>12</sup> reported a case and summarized part of the literature in 1891. He concluded that the sinuses were caused by amniotic adhesions. Paget<sup>13</sup> also reviewed reported cases. Miller<sup>14</sup> was the first to report a case from America. His case

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had wide deep sinuses opening onto large papillae on either side of the median line. The lesion did not show if the young woman kept the lower lip partly retracted by the upper teeth. No article has yet mentioned Touchard's<sup>15</sup> monograph, a copy of which is in the Surgeon-General's Library. In 1906, Stieda<sup>16</sup> reported a case in a patient with hare-lip and cleft palate. He reviewed the literature, made a microscopical study of the lesion and concluded that the malformation arose from excessive growth



The lower lip shows the orifices of the paramedian sinuses.

through closure on both sides of the embryonal furrow of the lower lip—that is, through transformation of the lateral furrows into one canal. In 1907 a case was reported by Clogg<sup>17</sup>, and one by Goldflam<sup>18</sup>, that was not accompanied by any other defect. Unterberger<sup>19</sup> reported two cases, one in a boy with double hare-lip and cleft palate, but of normal parents; the other case was not associated with any other malformation in the family. He found no secretion in the sinuses. A case has been reported by Oberst<sup>20</sup>. De Nancrede<sup>21</sup> has reported two cases from America and has

quoted the independently derived opinion of Huber the histologist, as to their cause. Huber's description of the development of the abnormality is essentially like Stieda's but less explicitly explained. The subject was monographed by Regnier<sup>22</sup> in 1913. Kahn<sup>23</sup> later reported a case and incompletely reviewed the literature. Kahn's case was in an otherwise normal boy born of parents who showed no abnormalities. In all, about thirty-five cases have been recorded. Besides the case I report, Dr. Lee Wallace Dean has had two or three other similar cases in his unusually large otolaryngological service.

**CASE REPORT**—Baby Met. Family history not obtainable. Female, 8 months old, full term, normal delivery. Baby has a complete cleft of hard and soft palate. The double hare-lip was successfully operated on by Dr. Lee Dean, the premaxilla which had protruded far forward and was attached by a thin pedicle now being in good alignment. Referred to Pediatric Department for feeding. Three millimeters on each side of median line of lip and six mm. orally from muco-cutaneous border is a sinus. The sinus mouths are not raised or inflamed and they will admit nothing wider than the smallest Bowman probe. The sinuses point toward the chin and are five mm. deep. When squeezed they give vent to a small drop of clear mucus. Immediately orally from the mouth of each sinus is a white, semilunar, raised area, the cusps of which point anteriorly. Just in front of the sinus openings are hemispherically raised areas about 4 mm. in diameter.

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## INFANTILE SYPHILIS OF THE LIVER

By EDWARD L. BAUER, M.D.

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The incidence of syphilis of the liver in infants is common enough, in fact, usually present in still-born syphilitic babies. However, as an exclusive infection of the liver, with no other evidence of the disease, it is quite uncommon in the first year or two of life.

The following case with the autopsy report is decidedly interesting from this viewpoint.

F. D., a colored infant, was admitted to the Children's Hospital, Mary J. Drexel Home, when it was one year of age. The labor had been normal and the child in good condition, except for a "little cold" that soon cleared up. He weighed seven and three-quarter pounds at birth; was weaned at the expiration of two weeks, the change being made for the mother's convenience, and then fed on Mellin's food for one month. He vomited Mellin's food. Then several brands of condensed milk were tried until the tenth month. Up to this time, the child seemed to gain and develop normally, so he was given "table food." At the eleventh month, the abdomen began to swell, and the child became jaundiced. The urine was very yellow, discoloring the napkins so that the stain could not be washed out. The child developed a cough, becoming progressively worse, and a fever that seemed to become more intense daily.

Physically, the child was markedly jaundiced, the skin dry and smooth, with no evidence of scratching or ulceration. Ears and nose negative; buccal mucosa pale yellow and the throat clean. It had three teeth. There were some râles in the lungs, and an impaired resonance. Heart sounds were feeble and embryocardiac.

Abdomen was very distended and pendulous. The veins on the anterior wall, especially about the umbilicus, were very prominent and full. An umbilical hernia was present. There was a flaring of the lower ribs, and the liver could be felt, despite the distension. The edge seemed rounded and smooth. Considerable

fluid was present, and paracentesis only relieved the patient for less than a day. The spleen was not palpable. Extremities—bowing outward of both tibia; reflexes normal. There was no adenopathy.

The temperature remained around 102° to 103° F. A Wassermann was positive plus 3. Father's Wassermann was negative. The mother gave a positive plus 2. The mother had been pregnant once before, giving birth to a full term still-born baby.

The clinical picture presented by the patient was evidently the climax of an infection born in this child, and not giving symptoms until the eleventh month. Incidentally, it had been insured prior to the eleventh month, the examiner telling the parents that the baby was a "fine specimen."

The autopsy showed that there was a diffuse hepatitis with intralobular sclerotic atrophy of the parenchyma, identified as lues; a passive congestion of the kidneys and a myocardial degeneration. No other lesions of any kind in any organ were found. The post-mortem examination was made in the mortuary and pathological laboratories of the German Hospital, Philadelphia, by Dr. Pfeiffer.

The unusual feature was the localization of the disease to the liver. It was typical in that the occurrence of jaundice and ascites was late, but they are not constant in infants.

Dr. Stills' case, at the sixth week, showed jaundice that disappeared. The child had a recurrence at two years of age and died. Cohn, in Virchow's Archives, cites a case of icterus, ascites and cerebral symptoms.

This case had no cerebral symptoms, gave its first clinical evidence at eleven months, and died within four weeks. Late jaundice and ascites were well marked, and it gave no clinical evidence substantiated by autopsy, of any other organic involvement.

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## REPORT OF A CASE OF CHYLOTHORAX \*

By GODFREY R. PISEK, M.D.

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*Abstract of History.* Blanche B.—age 2 months and 1 week. She is of Italian parentage, born in New York City, and the youngest of three children, the others are living and well. She was born at term, after a normal labor, the birth weight being ten pounds. The child has been nursed only. There is no history of any injury; the baby was considered well and had no illness until 10 days ago when she became sick and within a few hours had a convulsion, the cause of which was unknown. There were no other symptoms except very rapid and difficult breathing, with no temperature or cough. The symptoms evidently suggested pneumonia, for a diagnosis of pneumonia was made and a bad prognosis was given by physicians who had previously seen the baby.

*Physical Examination.* When first seen the infant was cyanotic and restless, breathing irregularly, 60 to 90 per minute, with a weak moaning cry. There was no temperature. The general tone was one of marked relaxation. There was a distinct area of flatness over the right chest posteriorly with a corresponding diminution of breath sounds, and some displacement of the heart; otherwise the physical findings were negative. A pleural effusion was suspected, and an aspirating needle was therefore inserted over the area of greatest flatness. Six ounces of a milky fluid was withdrawn. The infant seemed relieved by the procedure, its color improved and it again took the breast when it was offered. A gloomy prognosis was given and plans made to observe the case. The fluid was sent to two pathologists. Chylous fluid either pseudo or true was suspected.

*Laboratory Reports.* Dr. Pease reported: A milky fluid, sterile, composed of fat and sero-globulins. Physical properties of a colloid and apparently a true emulsion. Diagnosis, chylous fluid. Dr. Sondern reported: Few leucocytes; 95 per cent. lymphocytes. No tubercle bacilli or other micro-organisms. No evidences of a causative factor were demonstrated.

\* Read before the Twenty-ninth Annual Meeting of the American Pediatric Society, held at White Sulphur Springs, W. Va., May 28, 29 and 30, 1917.

For five days the improvement was quite marked when the hyperpnea returned again and the child was brought back for re-examination. Physical evidences of fluid were present. 9 ounces of a similar fluid were aspirated producing rapid and marked relief. The baby's weight previous to the tapping was 9 pounds, 4 ounces. The mother was now induced to send the baby to my service at the hospital. Urine and other examinations were negative.



Radiograph shows effusion in right chest with some displacement of heart to the left.

*Blood Examination.* Red blood cells, 6,350,000, hemoglobin 70 per cent., eosinophiles 3 per cent., large lymphocytes 5 per cent. White blood cells, 15,000, polymorphonuclears 55 per cent., basophiles 1 per cent., small lymphocytes 36 per cent.

The radiographic examination showed an effusion in the right thorax with some displacement of the heart and the mediastinal contents to the left. There was a partial collapse of the right



lung. Fluoroscopy of the esophagus following a bismuth meal showed no abnormality. Abstract of hospital laboratory report:

Fat 3.5 per cent., cell count 12,160, per cmm., eosinophiles few. Diagnosis, chylous fluid.

It was desired to prove conclusively the character of the fluid and to that end  $7\frac{1}{2}$  grams of sudan III was first given to a rabbit of approximately the same weight. This dose not being lethal, the same amount was given to the baby. Bright red stools followed. When thoracentesis was performed 18 hours later, a pink stained specimen of the chylous fluid was obtained. The baby gained in weight, taking its mother's breast and 2 feedings of a formula. The stools were yellow; the respirations averaging 30 to 40 per minute. Temperature 98-99° F. Pulse 120-140.

The baby was allowed to return to its home 22 days after admission, having gained 7 ounces in weight and having none of the symptoms previously noted. It was seen last a few days ago, and at that time physical signs of fluid were wanting, a puncture was made and no fluid obtained. The baby weighed 10 pounds, 13 ounces, and was apparently in excellent condition.

*Discussion.* The case is reported because of its rarity and from the standpoint of prognosis. In the literature it is necessary to distinguish between true and pseudo-chylothorax. Bargebuhr in the Deut. Arch. f. Klin. Med., 1895, Liv reports 22 true cases and 19 pseudo cases, in which series there were 2 cases below 12 years (one at 2 years and the other at 9 years of age.) Sherman reported a case of chylothorax in a boy  $4\frac{1}{2}$  years old (Archives of Pediatrics, Sept., 1907), in which he gives a tabular statement of 11 cases under 14 years of age, the youngest being 18 months. This case is probably the youngest on record; the baby being nine weeks old.

*Etiology.* Trauma, new growths, tuberculosis, and thrombi are given as etiologic factors. Not a single congenital case is cited.

*Treatment.* Resection, whenever followed, resulted badly and is therefore contra-indicated. Thoracentesis for relief of symptoms is the best practice.

*Prognosis.* In the true cases the prognosis is bad; being variously given from 50 to 75 per cent. If the pseudo-chylous cases are included 40 to 50 per cent. is the mortality.

*Diagnosis.* This is made on physical evidences of fluid; while the absence of febrile characteristics is significant. Puncture and laboratory tests are necessary for a complete diagnosis, and to distinguish the true from the pseudo form.

*Conclusion.* The etiologic factor in this case can only be assumed and may be attributed to the convulsive seizure, which may have changed the pressure in the duct and caused a rupture. The cure can again only be accounted for by the relief of pressure and a probable enlargement of the anastomosing lymph branches which connect the thoracic with the right lymphatic duct.

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LONGITUDINAL SINUS A SITE FOR OBTAINING BLOOD AND FOR TRANSFUSION. (Can. Med. Assoc. Jour., 1917, vii, p. 226.) E. M. Tarr finds that puncture of the longitudinal sinus is a safe, simple and practical method of obtaining blood for diagnostic purposes. It can be done in any home or clinic. Very little assistance and apparatus are required. Intravenous medication may be attempted by this route by the general practitioner under ordinary circumstances. Blood transfusion by the sinus route offers many advantages over other methods and transfusion should be added as a therapeutic measure in the treatment of many diseases—hemorrhagic disease of the new-born, primary hemorrhage, and the treatment of toxic and septic acute infectious diseases and in marasmic infants. The writer has entered the sinus 207 times for blood and has been disappointed but three times. Dextrose solutions have been administered sixty-four times in forty-nine infants. Salvarsan and diarsenol have been administered to eight infants under two and to one child twenty-eight months old. Nineteen cases of so-called acidosis in infants under two years were treated with sodium bicarbonate solution intravenously with fifteen recoveries. One child three years old was given, during a period of five days, 980 c.c. of the solution; discharged well on the tenth day after admission. A gold-plated lumbar puncture needle was used. The sinus grows gradually larger toward the back of the head and for this reason it is well to puncture the fontanelle as far posteriorly as possible.—*The American Journal of Obstetrics.*

## THE MEASLES PROBLEM

By CHARLES HERRMAN, M.D

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With the possible exception of whooping cough and epidemic catarrh, no other communicable disease of childhood is more difficult to control than measles. It is impossible to legislate it out of existence. Rules and regulations, no matter how well formulated, will not suffice; and many of them are impractical and useless. The notification of the Department of Health, is important for statistical purposes, and together with the placarding of the apartment in which the case occurs, is valuable in inducing the other tenants and neighbors to keep *their* children away from *all* the children of the family in which measles occurs. The difficulty is that the primary case has already infected them, before it is recognized. The same holds true, when the patient is removed to a hospital. This is usually done when the eruption is distinct, and by that time the damage has already been done.

Most of the statistics of morbidity and mortality from measles, are unreliable. Depending on the regulations of the local Department of Health, from 25 to 50 per cent. of all cases are not reported. Many patients are never seen by a physician. In the large centers of population, the morbidity and mortality rate has been somewhat reduced during the last few years; but the great difficulty in the prophylaxis still lies in the fact that the disease is highly and most communicable, before the eruption appears, that is, at a time when in most instances, its presence is not even suspected. During this stage, the child may mingle freely with others, and spread the disease broadcast. Prophylactic measures which begin with the appearance of the eruption, are of no value. Disinfection of the room occupied by the patient is unnecessary and useless, as the infectious material is conveyed by the patient, and not by the room or by articles in the room. (*Pediatrics*, May, 1908.) It quickly loses its virulence when exposed to air and sunlight, so that a thorough airing and cleaning of the room is sufficient.

*Schools and Kindergartens.* All children who have had an attack of measles, and have been under the care of a physician, should receive a certificate. (*Intern. Arch. School Hygiene*, 1909,

page 12.) This should be kept, so that if a case of measles occurs later in the same family, the child need not be excluded from school; and the susceptibles and non-susceptibles will be known. School teachers should be instructed, in order that they may become familiar with the early manifestations of the commoner communicable diseases of childhood, so that those children who present suspicious symptoms can be immediately isolated, and referred to the medical school inspector for further examination and diagnosis. (Intern. Arch. School Hygiene, page 3.) When a case of measles occurs in one of the class-rooms, all the susceptible children should be examined regularly. It is practically impossible to exclude all pupils who have any catarrhal symptoms, for at certain seasons of the year, this would mean the exclusion of a very large percentage. The regular *weighing* of all the children, in order to detect the loss in weight during the latter part of the period of incubation, is difficult to carry out in the public schools, and is unreliable, on account of the difference in kind and amount of clothing, the amount of food taken, the presence or absence of a full bowel or bladder, and the loss of weight that might be due to other conditions. If it were possible to take the *temperature* of all susceptibles several times a day, it would be of distinct value in detecting the initial rise, and isolating the patients early; but this is hardly possible in our public schools. As a medical school inspector in the New York Department of Health for many years, I had an opportunity to study this problem. Such determinations of temperature would have to be made by the school nurse. Only rectal temperatures are reliable, at least in the children in the kindergarten and lower classes, in which the larger number of cases of measles occur. Each child would have to be provided with his own thermometer, and a certain number would have a slight rise of temperature, which was due to other causes. All these would have to be sent home. Anyone who has had some experience in medical school inspection, knows what that means. Some years ago, (N. Y. Med. Jour., June 28, 1901), I suggested a method, which, I believe, is more practical, namely, the daily examination of the mouths of all susceptibles, in those classes in which a case of measles has occurred, especial attention being given from the tenth day after the primary case developed, at which time the first symptoms



will show themselves in the secondary cases. Such an examination can be made very quickly, and as soon as the Koplik or tonsillar spots are seen, the child may be excluded from school.

*Home versus Hospital Treatment.* It is a well recognized fact, that the mortality from measles is much greater in hospitals and in other institutions, than in private practice. Holt in 300 cases under 3 years of age, which occurred in an epidemic of measles in an institution, had a mortality of 40 per cent.; and in another epidemic of 143 cases under 5 years of age, the mortality was 35 per cent. At the Berlin Charité, Henoch had a mortality of 30.3 per cent. Between the years 1882 and 1894, in the children's hospitals of Paris, according to Comby, the mortality from measles averaged 35 per cent. That this high mortality is not due to the severity of the epidemic, is shown by a series of 192 cases which occurred in one epidemic, which was recently reported by Landé. Of these 192 patients, 47 were treated in the hospital with a mortality of 30 per cent.; 145 were treated in their own homes, with a mortality of 3.4 per cent. In institutions for orphans and foundlings, there is no selection of severe cases; and even if due allowance is made for the fact that the more severe cases are apt to be referred to the hospital, the difference in the mortality is striking. In a series of 408 consecutive cases which I treated in their homes, the majority in tenements, without a trained nurse, one-half under 3 years of age, the mortality was only 1.5 per cent. The chief disadvantages of hospital treatment are, the danger of cross infection, and the lack of individual care. Only in rare and exceptional cases, is it impossible to keep the child at home. Every physician has had patients who were sent to the hospital with one communicable disease, and contracted another. A child with rubella, incorrectly diagnosed as measles is referred to the hospital. Although the temperature is only slightly elevated, and there are no distinct buccal manifestations, the admitting physician naturally takes it for granted that, as the eruption is already well developed, these symptoms have already disappeared. The patient is placed in the measles ward, and two weeks later develops measles; so that instead of being sick for four days, he is isolated for four weeks, and if complications occur, for a still longer time. It is impossible to entirely prevent cross infection; for even under the most

favorable conditions, there is an irreducible minimum of 2 to 3 per cent. of such infections. Those who advocate the hospitalization of the majority of cases of measles, in institutions that are properly constructed for the purpose, and are able to give the most modern and approved care, forget the expense which this would entail. In New York City, in 1916, which was not a bad year, 21,603 cases of measles were *reported*. Of course a much larger number really occurred. Under the improved conditions of a modern, properly constructed hospital, giving adequate care, the treatment of each patient would cost the city at least \$25. Assuming that only one-half of the reported cases were transferred to the hospital, the total cost would reach the very substantial sum of \$250,000 annually. The authorities are already at their wits end to obtain the necessary funds, why should they be burdened with this unnecessary expenditure? Even among the poor, there is seldom any trouble in treating the patient at home, the mother or a relative acting as nurse. Even though they are untrained, it is one nurse to each child, and they naturally have a deeper interest in the child's welfare. Even in the poorest surroundings the danger of cross infection is avoided.

After years of observation of the spread of measles, I have become convinced, that a real control, and a distinct reduction in morbidity and mortality is impossible with our present prophylactic measures. A true control can only be obtained by the immunization of infants against the disease. During the last three and a half years, I have tested such a method. (Archives of Pediatrics, 1915, p. 503.) In a paper recently published, (Archives of Pediatrics, April 1917), Wilson, after stating that the measles problem would be greatly simplified if we were able to safely produce an artificial immunity, goes on to say that "although his (Herrman's) experience apparently justifies his belief, it is difficult to reconcile his results with our own experience of measles in infants. For the five years ending July 1, 1916, out of 2,614 cases of measles treated at Ellis Island, 18 were under 5 months, of these 5 died, giving a case fatality of 27.7 per cent. for infants under 5 months of age. This series of cases alone should be sufficient to warrant a conservative attitude toward the practice of inoculation for the prevention of measles." I do not believe that any conclusions for the City of New York can be drawn from the series which occurred at Ellis Island. As Wilson

himself states, the conditions there were particularly unfavorable, as may be seen from the following figures:

	1913, 1914	1912, 1915, 1916
Number of cases of measles, all ages..	1,675	949
Severe complications.....	21 per cent.	10.5 per cent.
Cross infections .....	3.2 per cent.	2.2 per cent.
Mortality .....	10 per cent.	6 per cent.

In the last 408 consecutive cases of measles which I treated in the home, only 24 or 6 per cent. had severe complications, and only 6, that is 1.5 per cent. died. The young infants at Ellis Island, apparently died not from the original disease, but from the complications, and these in turn, were partly due to cross infection. That is the chief objection to hospital treatment. I immunized only perfectly healthy infants between 4 and 5 months of age, and none of them were in hospitals, asylums, or other institutions. I have now immunized 122 infants, and in not a single case was there any unfavorable effect. It goes without saying that the proper precautions must be observed. Every physician can testify to the *relative* immunity of infants under 5 months of age, *in large centers of population*. On the other hand in small isolated spots, in which measles epidemics occur only at long intervals, it is possible for a woman who has never had measles to become a mother. Her infant would not enjoy this relative immunity. In New York City measles is always present, so that there are very few mothers who have not had the disease, and therefore the vast majority of the infants are relatively immune during the first 5 months. That persons who come from rural districts may reach adult life without acquiring measles, is well illustrated by the recent experience in our camps. At Camp Wheeler, Georgia, of 10,000 recruits drawn principally from the rural population, 3,000 or 30 per cent. contracted measles, when the infection was introduced into the camp. At Camp Upton, New York, with the recruits drawn chiefly from densely populated urban districts, very few cases of measles occurred, as they had practically all had the disease already. Recently a small battalion of colored troops from the South came to this camp, and during the first week 10 cases of measles appeared; whereas among several thousand colored troops from

New York City at the same camp, not a single case developed. Wilson's patients were largely of Slavish and Austrian parentage, a large number coming probably from small villages in Russia and Austria. This may possibly explain the lack of relative immunity on the part of their infants, and throw light on the apparent discrepancy as to their susceptibility. In conclusion, I should like to again emphasize the fact, that the *child with measles should not be sent to the hospital.*

250 West Eighty-eighth Street.

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HUNGER IN INFANTS. The material investigated by Taylor included five premature infants weighing from 1,200 to 2,500 gm., forty full term new-borns under 3 weeks of age, and eleven older babies, five between 1 and 2 months, two between 3 and 4 months, three between 4 and 6 months, and one boy of 2 years with a surgically induced gastric fistula made necessary by the effects of corrosive in the esophagus. The gastric movements of some of the infants were recorded only once; on others as many as twenty observations were made. The results of this work fully confirm Carlson and Ginsburg's report that the stomach of the new-born infant exhibits greater hunger contraction than does that of the adult. In normally developing breast fed babies, hunger is not ordinarily an immediate cause of crying. The average time required for the development of hunger in healthy infants gaining in weight and receiving a known sufficient amount of food is, in prematures, under one month, one hour and forty minutes, with a maximum of two hours and twenty minutes and a minimum of forty minutes; in full term infants under 2 weeks, two hours and fifty minutes, with a maximum of four hours and a minimum of two hours; in infants from 2 weeks to 4 months, three hours and forty minutes, with a maximum of four hours and thirty-five minutes and a minimum of three hours and twelve minutes. Hunger contractions occur in these infants long before the stomach has emptied. Consequently their presence is not in itself an indication that the stomach is ready for food.—*American Journal Diseases of Children.*



# THE NEED OF STANDARDIZING THE STATISTICS OF CHILD-CARING INSTITUTIONS, FOUNDLING ASYLUMS, ETC.\*

By SHIRLEY W. WYNNE, M.D.

Chief, Division of Statistical Research, Department of Health, New York City.

Upon examining the yearly reports of institutions devoted to the care of infants, one is struck by the lack of uniformity in the methods of treating the data collected. But little space in these reports is devoted to tabulations of the causes of illness and of death of their charges, and, indeed, from that which is published one can obtain but little evidence upon which to base an opinion as to the degree of success that has attended the efforts of their staffs. For the most part the reports are given up to lists of committees, of benefactors, and to statements of funds. There is no doubt but that to persons interested in the management of these institutions this information is of interest and deserves its place in the yearly reports, but, on the other hand, it does not seem proper that the most important subject, vital statistics of their charges, should be disregarded or limited to a page or two of perfunctory tabulations.

In attempting to devise a method of presenting and studying the incidence of disease and death among infants in institutions, one must bear in mind the important fact that the physical condition of these children varies greatly. Therefore, those institutions that receive a large percentage of children whose physical condition is of low standard, will, of necessity, experience a higher disease incidence and a higher mortality than those institutions that receive children of a higher physical standard. Likewise, since the morbidity and mortality rates of children change almost from day to day during the first year of life, it necessarily follows that the ages of the children will also have a most important bearing upon their illness and death rates. Therefore, before any system of statistics can be devised, standards of physical condition must be adopted and the children classified according to these standards.

\* Read January 17, 1917, at a conference held at the Department of Health, City of New York, to discuss the methods of standardizing statistics of child-caring institutions.

The question of ages will be discussed later. We will first consider the determination of standards. This is difficult and requires thought and discussion. The simplest plan is to base the classification of the child's condition upon its weight and height, ignoring in this classification all reference to the presence or absence of disease. In other words, if disease is present the child is first entered among the total population of the institution, in its proper group and class, and a second entry is made among the children that are ill. Perhaps the idea can be made clearer by taking a concrete example: Let us suppose that a syphilitic child is admitted to an institution. It should be first examined as to its general physical condition and its class, determined by its weight and height. It is then entered amongst the population of the class and group to which it belongs. The presence of disease is then determined and upon the termination of its illness by recovery or death, a certificate is made out and forwarded to the Central Bureau.

If this plan is put into operation, it will be possible to compare the results obtained each year in each institution and it will also be possible to compare the results obtained by the different methods of feeding, as well as to compare the morbidity and mortality of children cared for in institutions with those boarded out. At the present time there is an absolute lack of means of measuring the efficiency of an institution or the value of any plan of caring for children. The vital statistics of the children, if properly standardized, will furnish us with just such an index, just as illness and death rates of communities, properly standardized, furnish us a valuable index of their healthfulness. In addition to the value of such statistics in the management of the institution, they would also be of inestimable value in making appeals for public and private financial support, for it is evident that the institution which displayed the greatest efficiency in caring for the children entrusted to it would be entitled to the greatest amount of support.

The following is a rough outline of a plan I would suggest. It must be remembered that the plan is entirely tentative and subject to such change as the persons interested in the subject may deem it advisable to make after consideration and discussion: First: The children in each institution should be divided into two main groups; those that are cared for in the institution and those

that are boarded out. Second: These main groups should be subdivided according to the physical condition of the children. As I have explained in a previous paragraph, the most satisfactory method of classifying the children is on a basis of weight and height. Third: Each class of each group should be segregated according to age, as follows: those under one month; those between one and two months; those in the third month; those in the fourth, fifth and sixth months; those in the seventh, eighth and ninth months; those in the tenth, eleventh and twelfth months. After the first year, yearly groups to the fifth year will suffice; and after the fifth year, five-year groups.

The population of the institution having been thus divided, the causes of illness and the death should also be segregated according to group, physical condition, sex, age, race stocks, and cause of illness and death. For the sake of uniformity the National Classification of Diseases and Causes of Death should be made the basis of the classification of illness and death. This classification contains many causes of illness and of death that will not be encountered among the children, while, on the other hand, several of the classification groups will have to be further subdivided in order to obtain the necessary detail. From the tabulation of the population and the cases of illness and the deaths, it will be possible to compute morbidity and mortality rates for each group and each class, and in this way to compare the results obtained in the institutions using the proposed system.

Specimen tables that I have prepared\* contain all the information that will be required for ordinary purposes and are readily understood and so easily prepared that their preparation should not place a heavy burden upon the institutions. The tabulation can be made either by hand or with the aid of an electrical sorter and counter. This latter method is hardly practicable for individual institutions since the volume of work would not be sufficient to warrant the expense of installing the necessary apparatus. If, however, arrangements could be made whereby the institutions could file their reports with a Central Bureau, this method would be both practicable and economical. Such a bureau might be established by the institutions themselves or it might be possible to arrange to have the institutions file their reports with the Department of Health and have the statistical bureau of that department make up the tabulations.

\* These may be obtained from the author upon request.

The adoption of a uniform method or system of recording and tabulating the statistics of child-caring institutions is of primary importance and our first efforts should be directed towards this end. On the other hand, it is essential to the success of any system to devise a practical plan of putting the system into operation. Personally, I feel that the Central Bureau plan would meet with the greatest success and I have, accordingly, prepared forms to be used in such a system. The system itself is fashioned after the present one of collecting birth and death certificates in use by the Bureau of Records. Dr. Bolduan some time ago suggested that the statistics of the general hospitals be collected in a similar manner.

Briefly, the system is as follows: At the termination by recovery or death of each case of illness occurring among the children under their charge, the institutions forward to the Bureau of Records a report or certificate giving the important statistical data. In the Division of Statistical Research the information contained in these reports is coded and transferred to what are known as "punch cards." From the punch cards the desired tabulations are prepared with the aid of a Powers Electrical Sorter and Counter.

The advantages of such a system are, first: uniformity; second: economy; third: absolute accuracy; fourth: preservation of the original data in such form that it is always readily accessible so that special studies or reports can be prepared promptly and economically. If such a system is adopted it will be feasible to elaborate upon the statistical tabulations which I have suggested, to the extent of studying the effect of legitimacy and illegitimacy, as well as the effect of race stock and other factors upon morbidity and mortality. At the present time there are approximately 26,000 children under 16 years of age cared for by institutions in the Greater City. On this basis it should be possible for 2 Powers machine operators, each receiving a salary of \$720 or \$780, per annum, to handle the illness and death statistics of these children. The work can be supervised by the Chief of the Division and any additional services rendered by the present office force. Therefore, the necessary cost of carrying on this system would be \$1,500 per annum. The cost of printing the required forms would be nominal. There would be no additional clerical work required on the part of the institutions as the clerks



who would prepare the illness and death reports would be relieved of the duty of preparing the yearly statistics of the institutions.

There is no doubt in the mind of anyone interested in the work of the child-caring institutions but that there is a dire need of standardizing the statistics of these institutions, and while the system that I have outlined is but tentative, it apparently answers every purpose, overcomes every obstacle and is at the same time practical and economical.

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ON CHOLESTERIN AND UREA IN THE CEREBROSPINAL FLUID OF SICK CHILDREN (Riv. di Clin. Pediat., 1915, xiii, p. 736.)—L. M. SPOLVERINI gives tabular results in 63 cases. With regard to the cholesterin content the results in an overwhelming majority were negative. In the few cases where it was present it was met with in very small quantities, from a maximum of 0.050 grm. per 1000 c.c. to a minimum of 0.036 grm. As a rule it is absent in diseases during the acute stage (tuberculous and meningococcic meningitis), including those not localized in the central nervous system (broncho-pneumonia, pneumonia); the exceptions are few and rare in tuberculous meningitis, there being one exception only out of 15 cases. The few cases where it was present, even in small quantities, were chronic forms, notably hydrocephalus and rickets, and in the periods of resolution or convalescence of some acute diseases, notably broncho-pneumonia. Intraspinal or intraventricular injection of antimeningococcic serum caused no variation in the amount of cholesterin before or after treatment. With regard to amount of urea, this was small, even in acute diseases, varying within the normal limits of 0.15 grm. to 0.50 grm. Only in one instance did it rise to 1 grm., a case of exacerbation of chronic nephritis. Further the experiments showed clearly that as the disease became more serious the amount of urea was proportionately increased, even reaching double that found in the first analysis. Hence observations of this kind are of practical utility from a prognostic point of view. It was not possible to trace any special relation between the quantity of cholesterin and that of urea.—*The British Journal of Diseases of Children*.

## DEPARTMENT OF ABSTRACTS

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### ORIGINAL CONDENSATIONS OF CURRENT PEDIATRIC LITERATURE BY THE EDITORS AND THE FOLLOWING ASSOCIATES

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HESS, ALFRED F.: INFANTILE SCURVY (*American Journal of Diseases of Children*, November, 1917, p. 337.)

In a study of the pathogenesis of infantile scurvy Dr. Hess arrives at the following conclusions: One of the several factors in the pathogenesis is faulty diet. Pasteurized milk was found to be a contributing cause if it was not fresh—if given twenty-four to forty-eight hours after pasteurization. From this point of view milk pasteurized in the city is preferable to milk pasteurized at the creamery, which reaches the consumer much longer after the heating process. Aging seems to play a greater rôle in the production of scurvy than heating, whether the milk was pasteurized or raised to the boiling point. It was found that even raw milk on aging loses its antiscorbutic properties. Infantile scurvy is not, however, a simple dietary disease. The diet is at fault in allowing the intestinal bacteria to elaborate toxins. It is doubtful whether the toxin is always the same, and therefore, whether from a strictly etiologic standpoint, this disorder should be regarded as an entity. Infantile scurvy is an intestinal intoxication or an auto-intoxication due to the overgrowth of harmful bacteria in the intestine. It is the product of an unbalanced flora which is no longer controlled by a proper dietary. Oliguria is a common symptom of scurvy. The mild therapeutic effect of citric acid may be ascribed partly to its diuretic properties. Orange juice also was found to bring about marked diuresis. One of the striking and important symptoms of scurvy is a susceptibility to infection (furunculosis, nasal diphtheria, influenza, etc.) Some hemorrhages are due to this secondary infection, and are to be regarded not as scorbutic, but rather as focal complications. Other

hemorrhages are truly scorbutic. Scurvy, however, is essentially a disorder characterized by malnutrition and not by hemorrhage, taking months to develop, and, from a clinical point of view, frequently latent or subacute.

HAROLD R. MIXSELL.

BROWN, JOHN MACKENSIE: ASTHMA ASSOCIATED WITH ETHMOIDAL DISEASE. (*Annals of Otology, Rhinology and Laryngology*, June, 1917, p. 397.)

In a report of twenty-seven cases of this association of diseases not often found in the young, the author cites three cases of four, four and a half and thirteen years, respectively, in which the asthma was cured in two and markedly benefited in the third by the removal of the tonsils and adenoids in all three, and by the additional resection of a deviated nasal septum in the oldest child. All three of them had hypertrophic ethmoiditis with blocked-up middle meati, but without pus infection.

S. W. THURBER.

NETTER, ARNOLD AND SALEANDIER MARIUS: THE PRESENCE OF MENINGOCOCCI IN THE PURPURIC ELEMENTS OF MENINGOCOCCAL INFECTION. (*British Journal of Children's Diseases*, April-June, 1917, p. 101.)

In this paper, read before the Societe de Biologic, Paris, the authors assert that they are able to prove that contrary to the general received opinion the cutaneous hemorrhages in cerebro-spinal meningitis are not due to intoxication, but result from meningococcic deposit around the vessels. Smears were taken from vesicles which developed on the surface of the purpuric patches. They showed a collection of diplococci decolorized by Gram's method. The first case was one of meningococcal infection without meningitis. In the second case the meningitis was preceded by purpura. These observations the authors regard as only of theoretical interest. It is claimed, however, a more constant diagnostic measure than blood culture. In a subsequent paper read before the Societe de Biologic, Paris, and published on page 104 of this issue of the *British Journal of Children's Diseases* is the report of another case, a fulminating one of a purpuric form of meningococcus infection without meningitis. In this instance in

spite of the absence of vesicles by mere scarification of the purpuric spots, they were able to detect the existence of meningococci, thus attributing the purpura to its true cause.

JOHN B. MANNING.

PEASE, MARSHALL C. AND ROSE, ANTON R.: THE BANANA AS A FOOD FOR CHILDREN. (*The American Journal of Diseases of Children*, November, 1917, p. 379.)

The summary of the authors' experiments was as follows: The banana is a useful fruit that can enter liberally into the child's dietary, provided it is fully ripe or well cooked. If eaten baked in the yellow stage of ripeness, or if eaten raw when fully ripe, the banana makes a delightful and highly nutritious article of food. Its composition (carbohydrate, 22%, protein, 1.3%) does not warrant the use of the banana as the main component of the child's dietary, but it can compete well with other fruits, and is decidedly to be preferred to candy. The nutritional value is relatively high, approximately one calory per grain of pulp; and its carbohydrates, when it is fully ripe or cooked, are not less assimilable than those of cereals or potatoes. In the raw fruit the digestibility is directly proportional to the ripeness of the fruit. There is no positive evidence that the banana influences bowel movement. In the many tests there was no suggestion whatever of any deleterious effect from consuming large amounts of fully ripe bananas. Prolonged use of the under-ripe fruit, on the other hand, developed undesirable symptoms. Ripeness can be readily determined by the color and texture of the peel. In ripening, the peel changes in color from its original deep green to a dark brown. In this change the color of the banana passes through several yellow stages which are generally taken to be signs of ripeness, but a yellow banana is not necessarily a ripe banana, and if consumed raw while it still has a green cast to the yellow color, the availability of its carbohydrates is comparatively low and the effect on the child's digestive system injurious. The banana ought not to be eaten raw until after the brown spots begin to appear. It is at this stage a full golden yellow and in its most attractive appearance. A completely browned skin is not in itself a sign of over-ripeness, and such fruit should be judged by the texture of the pulp. The dark brown of the peel, however,



should not be confused with the darkening due to bruises. An injured banana is soon invaded by molds and yeast cells, both through the abrasions and the broken end, so that the banana "finger" should not be broken from the "hand" or stem, but cut off in such manner as to leave a good margin between the cut surface and the pulp. The banana properly handled and allowed to ripen is a wholesome food, uncontaminated by dirt and pathogenic germs, even if purchased from the push-cart in our congested streets.

HAROLD R. MIXSELL.

KEIPER, GEORGE F.: A CASE OF ACUTE MASTOIDITIS WITH AN ENORMOUS LEUCOCYTE COUNT—BOTH MASTOIDS OPENED—RECOVERY. (*Annals of Otology, Rhinology and Laryngology*, June, 1917, p. 548.)

A four year old boy who had had an attack of tonsillitis four weeks before being seen by the author and in whom this infection had resulted in a bilateral otitis media. When seen, he had an acute mastoiditis on the left side and a right mastoid exhibiting suspicious symptoms. He was sent to a hospital for blood counts and the first one showed 60,090 white cells, 91% being polymorphonuclear. This first count was verified by another one made on the same day. The left mastoid was operated upon the next morning and on January 6th, two days after admission, the leucocyte count had fallen to 16,500 and the polys to 80%. As the pulse rate remained high in relation to the temperature and the leucocyte count did not diminish to any marked degree and as a swelling developed behind the right ear, the right mastoid was opened on the 16th and abundant pus evacuated. By the 22nd the temperature had returned to normal and on February 8th the boy was discharged from the hospital.

S. W. THURBER.

PYBUS, FREDERICK C.: A CASE OF MULTIPLE URINARY CALCULI. (*British Journal of Children's Diseases*, April-June, 1917, p. 97.)

A boy, ten years, came into the hospital with marked swelling of the scrotum, penis and lower abdomen with great pain on urination. Sometime before this attack he had pain and frequent mic-

turition. Three years before he had a similar attack at which time multiple incisions were made over scrotum and groins and a calculus found impacted in the urethra. In the second attack of retention and extravasation of urine the scars of the previous operations were plainly visible. Excision was made in the scrotum and a small stone was found impacted in the urethra. On x-ray examination a large oval calculus was located in the pelvic portion of the left ureter and a second in the right kidney. These stones were removed in two separate operations with good convalescence. There was an associated pyuria.

JOHN B. MANNING.

CAMERON, H. CHARLES, M.D. Contab., F. R. C. P. Lond.:  
NERVOUS UNREST IN THE INFANT AS A CAUSE OF THE FAILURE  
OF BREAST-NURSING. (*The Lancet*, Sept. 1, 1917, p. 345.)

The author reviews his article on causes for failure of breast feeding, printed in *The Lancet* of September 27, 1913, in which he differentiates between causes that are maternal and those present in the infant, the latter included dyspnea from stoppages in the nasopharynx, bronchitis, and congenital heart disease; infective or toxemic states; mechanical conditions, and asthenia.

He now calls attention to inhibition of the sucking reflex through nervous unrest and excessive emotional display as a fairly common cause of failure of breast feeding. The sucking reflex is normally quite easy of excitation but fails when the infant is too somnolent and inert, and when there is extreme excitement. These neurotic infants are easily startled, will not sleep, and often cry and shriek for hours at a time. When they do nurse it is spasmodically and too rapidly; indigestion, pain, and more crying ensue. The cumulative unrest and the distracted household often lead to an early trial of bottle feeding.

Fortunately the condition is comparatively amenable to treatment, both general and medicinal. In a general way, much may be accomplished by doing everything to keep the infant as quiet as possible, to gain more sleep.

It may be necessary to break away from a strict routine of feeding in order to forestall severe outbreaks of emotion and to nearly always begin feedings while the infant is asleep, good feeding and better digestion are thus obtained.

If sleeping periods are not sufficient in number to bring about this quiet feeding which is so essential, it may be needful to give a sedative, one grain doses of chloral in a teaspoonful of water with a little syrup of orange given about twenty minutes before two or three feedings daily has given excellent satisfaction both as to improved feeding and control of the nervous dyspepsia in these lean, high-tension infants.

The writer is loath to suggest further drug-taking by infants who probably already suffer from over-prescribing, but feels that this judicious use of chloral will be found effective in overcoming this digestive hyperesthesia which seems to be dependent upon excessive emotional display on the part of the child.

The differential diagnosis of these cases is not always easy, determination of the cause of early failure of nursing is often difficult enough, the pity is that it is sometimes not even attempted.

WILLIAM LYON.

JONES, EDWARD BARTON: FACIAL PARALYSIS AS A COMPLICATION OF ACUTE OTITIS MEDIA. (*Annals of Otology, Rhinology and Laryngology*, June, 1917, p. 523.)

The involvement of the facial nerve in otitis is easiest explained by supposing the existence of a dehiscence in the wall of the Fallopian canal; pressure upon the nerve by reason of swollen membrane or the presence of fluid would cause paralysis which should disappear when this pressure is relieved; promptly in the case of fluid pressure only and less promptly if the membrane lining the middle ear is also swollen. Both these conditions are often present at the same time. Free and early incision of the drum is the treatment to be first instigated and if the paralysis should persist after the inflammatory symptoms have abated, electricity and massage may be employed.

The case reported was that of a five year old boy who had had chicken-pox and influenza in February, 1915, but appeared to be entirely well until March 8th when he complained of severe earache. Examination of the ear showed a pink drum but no bulging. On March 12th, facial paralysis developed and his temperature was 101°. Drum incised on the 12th and a culture of the exudate showed streptococcus infection and an autogenous vac-

cine was prepared but not used until the 21st on which day the paralysis had practically gone. On April 8th the patient had recovered.

S. W. THURBER.

ASHBY, HUGH T.: A CASE OF ACUTE DELIRIUM WITH LOBAR PNEUMONIA. (*British Journal of Children's Diseases*, April-June, 1917, p. 111.)

The author reports a boy of two years who during the course of a lobar pneumonia developed an acute delirium. The remarkable feature of the case was that while the delirium began two days before the crisis, it was not until after the crisis when sleep is the usual thing, that he became acutely delirious. For thirty-six hours he could not sleep, take food or be quieted. The pupils were widely dilated, he was incontinent, did not recognize his parents and could say nothing. The temperature at this time was only slightly raised. Early during the disease it had been 105° most of the time. The improvement was gradual over a few days with complete restoration of his mental condition.

JOHN B. MANNING.

COATES, GEORGE M.: REPORT OF THREE CASES OF BRAIN ABSCESS OF OTITIC ORIGIN. (*Annals of Otology, Rhinology and Laryngology*, June, 1917, p. 408.)

A twelve year old boy was admitted to the Pennsylvania Hospital in May, 1913, with the history of a simple mastoidectomy on the right side two years before and a radical mastoidectomy on the left side one year before admission. He had had free aural discharge on the right side associated with considerable pain for five days and general headache for two days with photophobia. The neck was rigid and Kernig signs were present on both sides. There was swelling and redness over the right mastoid. Lumbar puncture revealed a cloudy fluid under considerable pressure. Operation showed much destruction of the mastoid bone in its upper part; ten days later the dura was incised because of bulging and signs of pus and a large abscess cavity evacuated. Colon bacillus infection in pure culture was found and the boy died five days later.



This case goes to show, along with a host of other similar ones, that a chronic ear discharge no matter how trivial or how quiescent during long periods of time, is always a serious menace to the life of the patient.

S. W. THURBER.

TORRES, CALIXTO: THE RELATION OF THE REACTION OF THE URINE TO THE DIET IN INFANTS AND CHILDREN. (*The American Journal of Diseases of Children*, November, 1917, p. 365.)

The following conclusions are drawn:

1. The difficulties which one often encounters in changing the reaction of the urine in children are very much diminished when a suitable diet is prescribed.

2. Diminishing the amount of protein in the diet to 2 gm. and sometimes to 3 gm. per kilo will often itself render the urine alkaline without using a drug.

3. In cases in which the amount of protein reaches the lowest physiologic limit without turning the urine alkaline, one may continue to diminish the acidity by adding vegetables to the diet.

4. In older children with whom the food is more varied, one can do much by regulating the diet.

5. In cases in which vegetables are used to turn the urine alkaline, one must use, if possible, vegetables in which the amount of protein is smaller in proportion to the salts, like fruits, rice, wheat, etc., rather than those which have a large amount of protein, like peas, beans, etc., vegetables which contain purins, like coffee, tea and cocoa, may increase the acidity, because they may produce uric acid.

6. In cases of infection, especially in infections of the urinary tract, and in cases of starvation, the urine tends to become more acid than in other conditions; therefore it is more difficult to render it alkaline.

7. When drugs are used without the proper diet, the doses necessary to make the urine alkaline are much larger than is ordinarily believed.

8. The action of drugs (either acid or alkaline) is very fleeting; therefore they should be given in large and frequent doses.

HAROLD R. MIXSELL.

## BOOK REVIEW

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ELEMENTS OF PEDIATRICS FOR MEDICAL STUDENTS. By ROWLAND GODFREY FREEMAN, A.B., M.D., Adjunct Professor of Pediatrics, New York University and Bellevue Hospital Medical School; Attending Pediatricist to the Roosevelt Hospital, New York, etc. Ex-President of the American Pediatric Society, New York. The Macmillan Company, 1917.

This book will prove a welcome addition to the library of the medical student, for whom it is primarily designed. It also should be well received by the pediatricist and by those men in general practice who see many children in the course of the year. It is elementary in character and will repay careful studying. Especially worth-while chapters are those on nursery hygiene, daily regime, feeding during the first year, and mixed feeding.

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ACUTE CEREBELLAR ATAXIA IN CHILDREN (Am. Journ. Med. Sci., 1916, cli, p. 24). J. P. C. Griffith records a case in a girl, aged 5 years, in which the symptoms developed rapidly without discoverable cause unless possibly she had suffered from influenza. The other noteworthy features were the very uncommon degree of nystagmus, the ataxia of the extremities, disturbance of the sensorium, affection of speech, slight increase of reflexes and complete recovery within a month from the onset. Griffith has collected 17 similar cases from the literature.—*The British Journal of Diseases of Children*.

NEUROTIC MANIFESTATIONS IN CHILDREN (Med. Record, 1916, lxxxix, p. 361.) A. Stern describes a case of a girl suffering from a functional neurosis (hysteria), of a boy suffering from a neurosis frequently diagnosed as chorea, but not correctly so, and of a child congenitally mentally defective, who suffered from constant states of fear and would go nowhere unaccompanied with his mother. The treatment in all these cases was to remove the cause and to produce such a change in the child's condition as would enable him to fit in with his environment.—*The British Journal of Diseases of Children*.

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**The Importance of Tonic Medication**—There are many times when suitable tonic medication is urgently called for. From stress and strain of work under unfavorable conditions, such as hot, humid and depressing weather, the human organism will become bereft of—or lacking in—its vital forces. All the functions of the body will suffer in sympathy with each other, and unless the sufferer is treated in time the result is sure to be a nervous breakdown. This is when the employment of a reliable tonic is indicated. Gray's Glycerine Tonic Comp. is especially effective because it acts by aiding and re-enforcing the natural forces of the body. It promotes the activity of all the varied functions concerned in the working of the body's mechanism and thus imparts vitality to the nervous system. A few days' use of this dependable tonic usually suffices to produce a marked and substantial change in the whole bodily condition.

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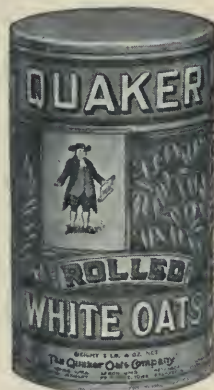
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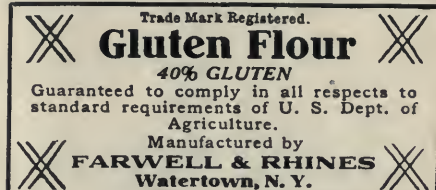
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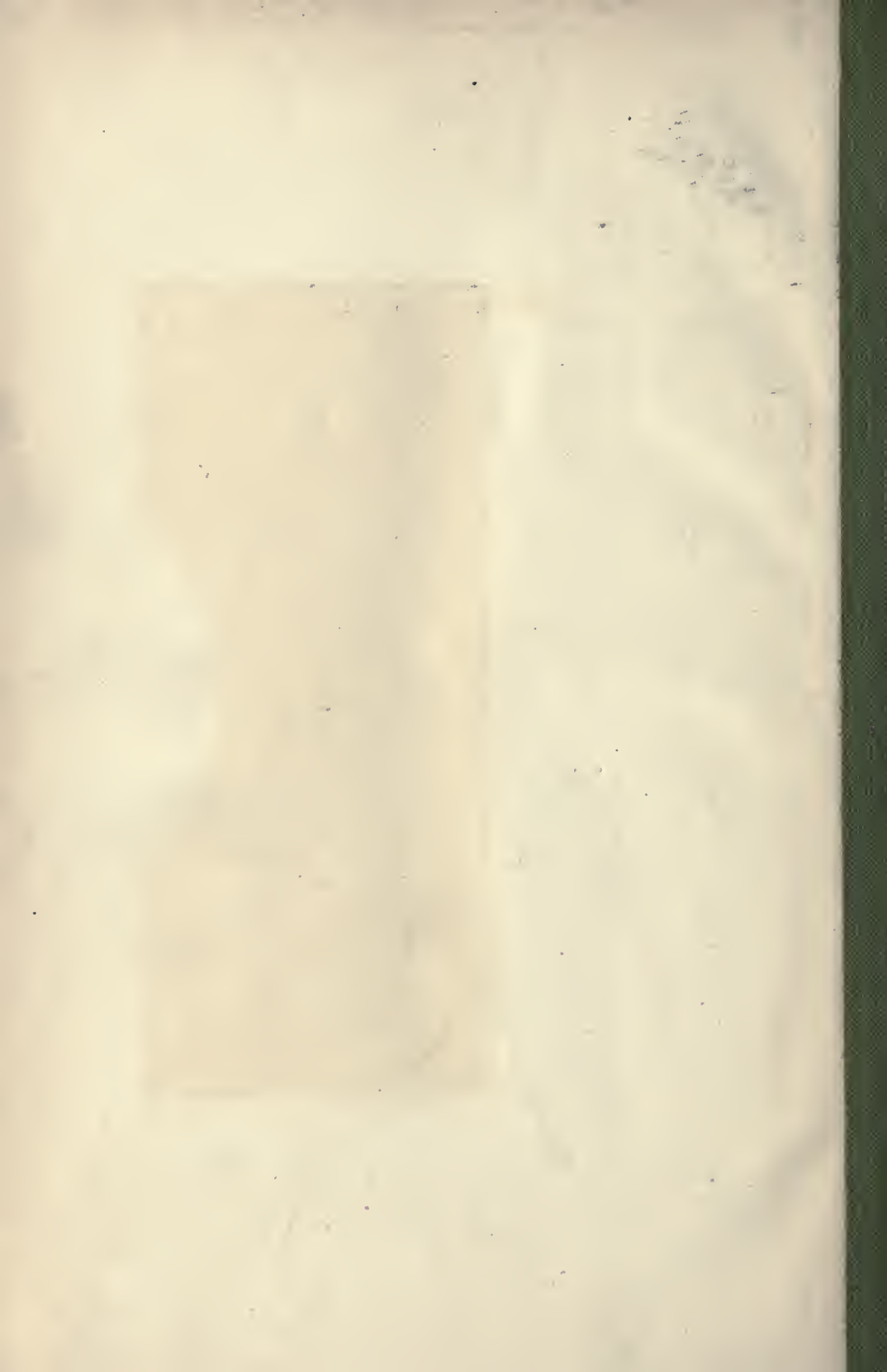
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